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MINERAL PRODUCTION FOR 1915

WITH MINING LAW APPENDIX

BULLETIN No. 71

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FERRY BUILDING - SAN FRANCISCO

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CALIFORNIA STATE MINING BUREAU

FERRY BUILDING, SAN FRANCISCO

FLETCHER HAMILTON — State Mineralogist

San Francisco] — BULLETIN No. 71 — [August, 1916

COMPLIMENTS OF
F. McN. HAMILTON
STATE MINERALOGIST

California Mineral Production for 1915

WITH MINING LAW APPENDIX

AND

COUNTY MAPS

By WALTER W. BRADLEY, Mining Statistician

CALIFORNIA
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LETTER OF INTRODUCTION.

The Bulletin herewith presented of the mineral industries of California is the result of a painstaking effort to so compile the statistics of production that they will be of actual use to producers and to those interested in the utilization of the mineral products of our state. In addition to the mere figures of output, we have included descriptions of the uses and characteristics of many of the materials, as well as a brief mention of their occurrences.

The compilation of accurate and dependable figures is an extremely difficult undertaking, and the State Mineralogist takes the opportunity of here expressing his appreciation of the universal co-operation of the producers in making this work possible. The response to our request for early replies is particularly pleasing. A fuller appreciation of the value of early responses to the requests sent out at the beginning of each year, will result in earlier publication of the data in the future.

It is the evidence herein put forth that should make us realize the magnitude of our latent mineral resources in this state. The total value for 1915 reached the sum of over ninety-six and a half million dollars, being a considerable increase over the preceding year.

For the current year of 1916, there is promise of still greater results in many lines. Except for the year 1883, the gold yield for 1915 was the largest California has shown since 1864. In addition to this, many inquiries are being received relative to this state's resources in the industrial minerals, such as asbestos, chrome, magnesite, manganese and many others.

FLETCHER HAMILTON,
State Mineralogist.

MINERAL INDUSTRY, CALIFORNIA, 1915

DATA COMPILED FROM DIRECT RETURNS FROM PRODUCERS IN ANSWER TO INQUIRIES SENT OUT BY CALIFORNIA STATE MINING BUREAU, FERRY BUILDING, SAN FRANCISCO, CAL.

CHAPTER ONE.

Mineral output in California during the year 1915 amounted to $96,663.369 worth of crude materials. There were forty-nine different mineral substances, and of the fifty-eight counties in the state all but two contributed some mineral product.

As compared with the 1914 output, the two notable features are the almost startling increases in some of the metals, and the decrease in petroleum, both in quantity and total value. The result, however, is a net increase in the grand total value, of $3,348.596 over the 1914 total.

Of the metals: Antimony again entered the active list after an absence of several years. Copper increased over 10,000,000 pounds in amount and $3.114,192 in value. Gold increased $1,788,800. Quicksilver increased about 25% in amount and more than doubled in value. Tungsten increased from a value of $180,575 to $1,005,467. Zinc increased from 399,641 pounds, worth $20,381, to 13,043,411 pounds valued at $1,617,383.

Petroleum decreased approximately 12,000,000 barrels in amount, but the average price per barrel was slightly higher, so that the net result was a decrease in value of $3,983,272.

The figures of the State Mining Bureau are made up from reports made by the producers of the various minerals. Care is exercised in avoiding duplication, and any error is doubtless upon the side of underestimation.

It would be folly to attempt to set a limit of maximum mineral production for California, because the mineral resources are so extensive and have been so slightly developed along many lines.

California yields commercially a greater number and variety of mineral products than any other state in the United States; and possesses latent possibilities in other items as yet undeveloped. The total annual value of her output is surpassed by but four other states—they being the great coal and iron producers of east of the Mississippi

River. Of several items, including borax, chrome and magnesite, California is the sole producer. For several years we have been leading all others in gold, petroleum, platinum and tungsten; but surpassed in 1915, for the first time in petroleum by Oklahoma.

The following table shows the yield of mineral substances of California for 1915, as compiled from the returns received at the State Mining Bureau, San Francisco, in answer to inquiries sent to producers:

Substance	Amount	Value
Antimony ore	510 tons	$35,666
Asbestos	143 tons	2,860
Barytes	410 tons	620
Bituminous rock	17,789 tons	61,468
Borax	67,004 tons	1,663,521
Brick	180,538 M	1,678,756
Cement	4,918,275 bbls.	6,044,950
Chromite	3,725 tons	38,044
Clay—pottery	157,866 tons	133,724
Coal	10,299 tons	26,662
Copper	40,968,966 lbs.	7,169,567
Dolomite	4,192 tons	14,504
Feldspar	1,800 tons	9,000
Fuller's earth	692 tons	4,002
Gems	----------	3,565
Gold	----------	22,442,296
Gypsum	20,200 tons	48,953
Infusorial earth	12,400 tons	62,000
Iron ore	724 tons	2,584
Lead	4,796,299 lbs.	225,426
Lime	356,534 bbls.	286,304
Limestone	146,324 tons	156,288
Lithia	91 tons	1,365
Magnesite	30,721 tons	283,461
Manganese ore	4,013 tons	49,098
Marble	22,186 cu. ft.	41,518
Mineral paint	311 tons	1,756
Mineral water	2,274,267 gals.	467,738
Natural gas	21,992,892 M cu. ft.	1,706,480
Petroleum	91,146,620 bbls.	43,503,837
Platinum	667 ounces	21,149
Potash	1,076 tons	19,391
Pumice	380 tons	6,400
Pyrite	92,462 tons	293,148
Quicksilver	14,199 flasks	1,157,449
Salt	169,028 tons	368,737
Sandstone	63,350 cu. ft.	8,438
Silica (sand and quartz)	28,904 tons	34,322
Silver	----------	851,129
Slate	1,000 squares	5,000
Soapstone and talc	1,663 tons	14,750
Soda	5,799 tons	83,485
Stone, miscellaneous*	----------	5,011,108
Tungsten concentrates	962 tons	1,005,467
Zinc	13,043,411 lbs.	1,617,383
Total value	----------	$96,663,369

*Includes granite, macadam, rubble, paving blocks, sand and gravel, and grinding mill pebbles.

The following table shows the comparative values of the several minerals produced in California during the years 1914 and 1915:

Substance	1914	1915	Increase	Decrease
Antimony ore		$35,666	$35,666	
Asbestos	$1,530	2,860	1,330	
Barytes	3,000	620		$2,380
Bituminous rock	166,618	61,468		105,150
Borax	1,483,500	1,663,521	180,021	
Brick	2,288,227	1,678,756		609,471
Cement	6,558,148	6,044,950		513,198
Chromite	9,434	38,044	28,610	
Clay—pottery	167,552	133,724		33,828
Coal	28,806	26,662		2,144
Copper	4,055,375	7,169,567	3,114,192	
Dolomite		14,504	14,504	
Feldspar	16,565	9,000		7,565
Fuller's earth	5,928	4,002		1,926
Gems	3,970	3,565		405
Gold	20,653,496	22,442,296	1,788,800	
Gypsum	78,375	48,953		29,422
Infusorial earth	80,350	62,000		18,350
Iron ore	5,128	2,584		2,544
Lead	183,198	225,426	42,228	
Lime	378,663	286,304		92,359
Limestone	517,713	156,288		361,425
Lithia		1,365	1,365	
Magnesite	114,380	283,461	169,081	
Manganese ore	1,500	49,098	47,598	
Marble	48,832	41,518		7,314
Mineral paint	847	1,756	909	
Mineral water	476,169	467,738		8,431
Natural gas	1,049,470	1,706,480	657,010	
Petroleum	47,487,109	43,503,837		3,983,272
Platinum	14,816	21,149	6,333	
Potash	460	19,391	18,931	
Pumice	1,000	6,400	5,400	
Pyrite	230,058	293,148	63,090	
Quicksilver	557,846	1,157,449	599,603	
Salt	583,553	368,737		214,816
Sandstone	45,322	8,438		36,884
Silica (sand and quartz)	22,688	34,322	11,634	
Silver	813,938	851,129	37,191	
Slate		5,000	5,000	
Soapstone and talc	4,500	14,750	10,250	
Soda	115,396	83,485		31,911
Stone, miscellaneous	4,860,357	5,011,108	150,751	
Tungsten concentrates	180,575	1,005,467	824,892	
Zinc	20,381	1,617,383	1,597,002	
Totals	$93,314,773	$96,663,369		
Net increase			$3,348,596	

The following table shows the comparative value of the mineral production of the various counties in the state for the years 1914 and 1915:

County	1914	1915
Alameda	$870,427	$861,683
Alpine		
Amador	3,211,109	4,063,762
Butte	1,755,782	1,622,245
Calaveras	2,005,954	2,161,893
Colusa	32,251	16,003
Contra Costa	1,149,321	1,309,505
Del Norte	5,938	4,524
El Dorado	149,226	428,336
Fresno	7,484,473	8,152,300
Glenn	30,553	46,667
Humboldt	233,332	358,686
Imperial	250,529	77,433
Inyo	2,085,112	2,771,042
Kern	28,040,296	25,335,184
Kings	740	18,608
Lake	63,503	72,534
Lassen	4,568	870
Los Angeles	4,665,504	4,168,612
Madera	203,009	145,063
Marin	554,137	160,528
Mariposa	187,505	412,326
Mendocino	560	24,536
Mereed	[1]111,701	94,032
Modoc	1,252	8,681
Mono	16,060	109,425
Monterey	114,254	84,986
Napa	971,748	884,221
Nevada	3,330,940	3,492,946
Orange	8,831,763	6,617,112
Placer	1,097,098	963,860
Plumas	161,308	745,715
Riverside	1,580,805	1,349,591
Sacramento	2,629,244	2,562,281
San Benito	436,259	642,065
San Bernardino	1,616,537	2,674,042
San Diego	315,267	211,129
San Francisco	119,889	128,270
San Joaquin	129,930	248,394
San Luis Obispo	63,465	227,632
San Mateo	246,478	177,891
Santa Barbara	2,686,309	3,984,966
Santa Clara	266,956	635,229
Santa Cruz	1,642,958	1,581,531
Shasta	5,047,838	8,350,133
Sierra	725,129	729,518
Siskiyou	385,825	514,094
Solano	1,683,866	1,335,923
Sonoma	326,144	276,104
Stanislaus	[2]5,882	191,771
Sutter		
Tehama	300	4,702
Trinity	747,282	499,511
Tulare	161,252	184,599
Tuolumne	1,050,928	1,171,438
Ventura	1,000,729	904,767
Yolo	736	2,040
Yuba	2,823,282	2,862,430
Asbestos, unapportioned	1,530	
Totals	$93,314,773	$96,663,369

[1]Includes output of a gold dredge in Stanislaus County. [2]See Merced.

CHAPTER TWO.

FUELS.

Among the most important mineral products of California are its fuels. This subdivision includes coal, natural gas and petroleum, the combined values of which make up approximately 50 per cent of the state's entire mineral industry. Comparison of values during 1914 and 1915 is shown in the following table:

Substance	1914	1915	Increase+ Decrease-
Coal	$28,806	$26,662	$2,144—
Natural gas	1,049,470	1,706,480	657,010+
Petroleum	47,487,109	43,503,837	3,983,272—
Totals	$48,565,385	$45,236,979	$3,328,406—

COAL.

Bibliography: State Mineralogist Reports VII, XII, XIII.

Coal has been produced in California since as early as 1860, but the quality is not high, most of it being lignite. In competition with fuel-oil, coal of all grades has had to give way, and the low-grade domestic product has suffered severely. Besides the counties noted below as showing a commercial production, workable bodies of coal are also known in Mendocino, Shasta, Siskiyou and Riverside counties.

During 1915, there was a production reported from Amador, Contra Costa and Monterey counties, totaling 10,299 tons, worth $26,662, most of it, however, coming from Amador and Monterey.

Since 1887, the annual output of coal has been as follows:

Year	Tons	Value	Year	Tons	Value
1887	50,000	$150,000	1903	93,026	$265,383
1888	95,000	380,000	1904	79,062	376,494
1889	121,280	288,232	1905	46,500	144,500
1890	110,711	283,019	1906	24,850	61,600
1891	93,301	204,902	1907	23,734	55,849
1892	85,178	209,711	1908	18,496	55,503
1893	72,603	167,555	1909	49,389	216,913
1894	59,887	139,862	1910	11,033	23,484
1895	79,858	193,790	1911	11,047	18,297
1896	70,649	161,335	1912	14,484	39,092
1897	87,449	196,255	1913	25,198	85,809
1898	143,045	337,475	1914	11,859	28.806
1899	160,941	420,109	1915	10,299	26,662
1900	176,956	535,531			
1901	150,724	401,772	Totals	2,065,019	$5,716,562
1902	88,460	248,622			

NATURAL GAS.

Bibliography: State Mineralogist Reports VII, X, XII. Bulletins 3, 16, 19, 69.

Statistics on the production of natural gas in California are largely guesswork, though each year becoming less so, as more data are available. The figures here given are certainly far below the actual production, particularly in the six oil-producing counties. It is an exceptional oil property where gas in some quantity does not occur. Many oil producing concerns make no mention of their gas, because they have no method of measuring it, and it is so widely used in the oil fields that it is frequently as lightly regarded as sunshine or fresh air. Doubtless, considerable gas is wasted, but a sweeping condemnation of operators should not be indulged in. It must be remembered that several of our important oil fields are removed many miles from the site of any other industry, and that the gathering of small amounts of gas and transporting it for any considerable distance, may not always be profitable. However, it is undoubtedly a fact that greater saving can frequently be made with profit. Gas traps of various size and design are coming into more frequent use. Some large operators are making commendable efforts to conserve the gas which accompanies oil and is richer than the so-called "dry gas" occurring in strata which do not produce oil. As far as possible, casing-head gas is used in driving gas engines for pumping and drilling.

It will be noted that several counties produce gas which is not accompanied by oil.

The value of gas as here shown is open to some question, but is certainly not too high. The average price is about 6¢ per 1,000 cubic feet. Approximately 7,000 cu. ft. of gas is equal to one barrel of oil in heating value, and is so accounted for by many operators. In driving gas engines, about 4,000 cu. ft. per 24 hr. are consumed by a 25 h.p. engine, which figure has been used in compiling this report.

Natural Gas, 1915.

County	M cubic feet	Value
Fresno	2,894,834	$253,906
Kern	12,163,461	737,638
Kings	258	608
Los Angeles	1,729,035	120,783
Orange	1,243,301	81,753
San Joaquin	161,923	143,974
Santa Barbara	3,193,368	279,697
Ventura	491,879	29,670
Humboldt, Sacramento and Solano*	114,833	58,451
Totals	21,992,892	$1,706,480

*Combined to conceal an individual producer in each.

The annual production of natural gas in California since 1888 is as follows:

Year	Value	Year	Value
1888	$10,000	1903	$74,237
1889	12,680	1904	91,035
1890	33,000	1905	102,479
1891	30,000	1906	109,489
1892	55,000	1907	114,759
1893	68,500	1908	474,584
1894	79,072	1909	616,932
1895	112,000	1910	1,676,367
1896	111,457	1911	491,859
1897	62,657	1912	940,076
1898	74,424	1913	1,053,292
1899	95,000	1914	1,049,470
1900	34,578	1915	1,706,480
1901	92,034		
1902	99,443	Total	$9,470,904

Gasoline from Natural Gas.

As above indicated, more or less gas usually accompanies the petroleum in the oil fields. A number of plants are in operation manufacturing gasoline by compression from this "casinghead gas." This subject was investigated recently by the U. S. Bureau of Mines and the U. S. Geological Survey, and described in considerable detail by G. A. Burrell et al.,[1] and J. D. Northrup.[2] A valuable article also appeared in one of the trade journals.[3] Upon the enlargement of its engineering force, in the near future, the Department of Petroleum and Gas, of the State Mining Bureau, intends to conduct a more detailed investigation of natural gas production with the idea of being able to point out means of more economical use of this splendid natural resource.

The largest natural gas field of commercial importance thus far developed in California is in the Midway district, followed by Santa Barbara, Los Angeles and Orange counties, in the order named. The Southern California Gas Company operates a 12-inch pipe line from the Midway field, a distance of 107 miles, to Los Angeles, where it supplies gas to local distributing companies. The California Natural Gas Company supplies gas to consumers in the Midway field and to local distributing companies at Fellows, Taft, Maricopa and Bakersfield. The Santa Maria Gas and Power Company distributes gas around Santa Maria, from wells in the neighboring oil fields.

[1] U. S. Bur. of Mines, Bull. 88.
[2] U. S. G. S., Min. Res. 1914, Pt. II, pp. 793–795; 798–800; 804–805.
[3] Oil & Gas Journal, Tulsa, Okla., Jan. 13, 1916, p. 62.

There were in operation in 1915 a total of 20 plants making casing-head gasoline by compression, with a total daily capacity estimated at 38,175 gallons, distributed as follows:

Field	Number plants	Gallons daily
Coalinga	1	1,450
Fullerton	6	9,250
Midway	1	2,000
Santa Maria	8	19,600
Salt Lake (Los Angeles)	3	3,575
Ventura	1	2,300
Totals	20	38,175

At Santa Maria, after the gasoline is extracted, the remaining "dry gas" is taken into the pipe lines of the Santa Maria Gas and Power Company, by whom it is distributed to consumers, both domestic and commercial.

[4]"There are many peculiarities in connection with the extraction of gasoline from gas that are ascertained only through the closest study. The percentage of gasoline taken from the highest grades of oil, it is natural to infer, is much greater than that taken from low grades of oil, and yet this does not always prove to be the case. Much depends upon the amount of oil produced with the relative amount of gas coming with the oil. For instance, if an oil well is a small producer of oil and a heavy gasser, the percentage of gasoline is much larger than it would be from the same amount of gas coming from a large production of oil. Old wells seem to be more prolific in gasoline than new wells.

"Aside from the Salt Lake field, only a small percentage of the gas coming from low-grade oil has proved to be of commercial value. This is especially true among new producing wells where the oil is of a gravity below 18 degrees.

"It is stated that as a general average gas coming from grades of oil of from 22°–25°, will make from four to six quarts to the thousand feet of gas; from 25°–29° it will average from two to three gallons per thousand feet, and above 29° it will average from three to five gallons per thousand feet.

"The richest gas so far discovered in the state is that found in the old Newhall field. The wells are all very old and small producers of high-gravity oil."

PETROLEUM.

Bibliography: State Mineralogist Reports IV, VII, X, XII, XIII. Bulletins 3, 11, 16, 19, 31, 32, 63, 69.

Chief of the fuels of California is petroleum. A complete description of the industry is to be found in Bulletin 69, issued in 1915 by the State Mining Bureau.

The oil production for California for 1915, as determined from the sworn statements made to the State Mineralogist for the Department of Petroleum and Gas, by all of the 363 producers, amounted to 88,240,620 barrels. This is doubtless the most accurate figure that has ever been obtained and it is of public interest to note that it is in close agreement with the figures given to the public at an earlier date by

[4]O. & G. Journal, loc. cit.

two private concerns, namely, the Standard Oil Company and the Independent Oil Producers Agency. Private parties publishing such information perform a distinct public service, the value of which should be more generally recognized, and encouragement given to enlarge its usefulness by touching upon the quality as well as the quantity of oil produced.

Of the total of 88,240,620 barrels, 33%, or 29,587,163 barrels was produced by the five large refining and marketing companies, and 16%, or 13,704,982 barrels was produced by the several large concerns, such as the railroad companies, who use the oil in their own service. The remaining 51%, or 44,948,475 barrels is credited to the smaller producers who usually sell the crude oil at the well. To the above amount we have added 2,906,000 barrels consumed for fuel at the wells, making a total gross output of 91,146,620 barrels, valued at $43,503,837, which is a marked decrease both in quantity and value as compared with the year 1914. The average price per barrel, however, is slightly higher, as may be noted by the table giving average prices. The major portion of the loss is due to the decrease of over 10,000,000 barrels in the output of the Midway-Sunset field. Several causes contributed to the decline, among which may be mentioned: Overproduction for several years previous; the closing of South American markets, temporarily, as a result of the European war; the suits instituted and threatened by the Federal Government against operators on unpatented land; and the elimination of the gusher wells.

Segregation of figures by counties can be made directly from field reports in all cases except for Los Angeles and Orange counties, where the fields cross county lines. Figures on price are open to some question, as it must be remembered that a large portion of the oil does not enter the open market, but is consumed or refined directly by the producers. The prices given are averages for the oil which is actually sold.

The business of producing oil is not so profitable as it should be. Many operators continue to drill wells when there is not a great demand, and overproduction, of course, depresses the price. Just profits and stable conditions are more nearly assured to the producer who is able to refine and retail his product. Realization of this fact is apt to lead to the formation of larger and stronger business units in the future. Doubtless, undue obstacles will not be placed in the way of such changes, if they are carried out with reasonable regard to public welfare. The fact can not be too strongly emphasized that our oil resources are far from inexhaustible, and that needless production hastens the day when we shall stand stripped of one of our most valuable assets. Raising oil from the ground and selling it at a price too low to return the invested capital with interest, is about the same as drawing gold from a savings account and disposing of it at a discount. As

in most lines of human endeavor, some operators have entered the oil business with more thought and preparation for the future than have others.

Production and Value of Oil by Counties.

County	1914		1915	
	Barrels	Value	Barrels	Value
Fresno	15,952,190	$7,210,389	14,021,025	$7,641,459
Kern	65,332,633	26,721,046	54,810,669	23,184,913
Los Angeles	3,558,690	1,957,279	2,931,098	1,843,661
Orange	12,758,678	8,612,108	12,715,457	6,510,314
Santa Barbara	4,325,787	1,989,862	5,634,534	3,442,700
Santa Clara	10,000	5,300	16,617	11,067
Ventura	943,929	991,125	1,017,220	869,723
Totals	102,881,907	$47,487,109	91,146,620	$43,503,837

Average Price of Oil, by Counties, in Cents per Barrel.

County	1914.	1915.	Increase+ Decrease−
Fresno	45.2¢	54.5¢	9.3¢+
Kern	40.9¢	42.3¢	1.4¢+
Los Angeles	55.0¢	62.9¢	7.9¢+
Orange	67.5¢	51.2¢	16.3¢—
Santa Barbara	46.0¢	61.1¢	15.1¢+
Santa Clara	53.0¢	66.6¢	13.6¢+
Ventura	105.0¢	85.5¢	19.5¢—
State average	46.1¢	47.9¢	1.8¢+

The annual production since discovery is as follows:

Year	Barrels	Year	Barrels
1875	175,000	1897	1,911,569
1876	12,000	1898	2,249,088
1877	13,000	1899	2,677,875
1878	15,227	1900	4,319,950
1879	19,858	1901	7,710,315
1880	40,552	1902	14,356,910
1881	99,862	1903	24,340,839
1882	128,636	1904	29,736,003
1883	142,857	1905	34,275,701
1884	262,000	1906	32,624,000
1885	325,000	1907	40,311,171
1886	377,145	1908	48,306,910
1887	678,572	1909	58,191,723
1888	690,333	1910	77,697,568
1889	303,220	1911	84,648,157
1890	307,360	1912	89,689,250
1891	323,600	1913	98,494,532
1892	385,049	1914	102,881,907
1893	470,179	1915	91,146,620
1894	783,078		
1895	1,245,339	Total	853,625,735
1896	1,257,780		

The total value is as follows:

Year	Value
1887–1909	$136,693,228
1910	37,689,542
1911	40,552,088
1912	41,868,344
1913	48,578,014
1914	47,487,109
1915	43,503,837
Total	$396,372,165

Production by Fields.[5]

(In barrels of 42 gal.)

Field	1914	1915	Increase+ Decrease-
Kern River	7,030,545	8,034,974	1,004,429+
McKittriek	3,820,857	3,552,801	268,056—
Midway-Sunset	50,025,843	39,318,093	10,707,750—
Lost Hills-Belridge	4,830,921	4,318,550	512,371—
Coalinga	15,925,887	13,548,159	2,377,728—
Lompoc and Santa Maria	4,303,080	4,536,840	233,760+
Ventura County and Newhall	968,421	1,036,305	67,884+
Los Angeles and Salt Lake	2,504,475	2,110,133	394,342—
Whittier-Fullerton	14,130,548	13,030,549	1,099,999—
Summerland	55,743	53,000	2,743—
Watsonville	27,375	27,375	
Totals	103,623,695	89,566,779	
Net decrease			14,056,916—

[5]Standard Oil Bulletin, January, 1916.

The following table is compiled from the monthly statements of the statistical bureau of the Independent Oil Producers Agency:

Well Operations, by Months, 1915.

Month	Number completed	Producing		Drilling	
		Active	Idle	Active	Abandoned
January	24	5,861	1,770	136	22
February	32	5,783	1,854	128	21
Mareh	20	5,813	1,842	136	9
April	33	5,884	1,783	138	11
May	41	5,943	1,718	138	38
June	30	6,049	1,631	134	18
July	36	6,083	1,608	143	19
August	23	6,153	1,549	150	13
September	31	6,109	1,618	148	3
October	20	6,159	1,598	152	6
November	20	6,149	1,622	161	12
December	24	6,196	1,595	172	4
Totals, 1915	334				176
Totals, 1914	438				129
Monthly av., 1915	28	6,015	1,682	145	15
Monthly av., 1914	37	5,867	1,583	222	11

The following table is compiled from the monthly statements contained in the Standard Oil Bulletin:

Well Operations, by Fields, 1915.

Field	Producing, Dec., 1914	Producing, Dec., 1915	Increase+ Decrease-	Completed	Abandoned
Kern River	1,385	1,684	299+	11	
McKittrick	251	276	25+	2	4
Midway-Sunset	1,376	1,418	42+	125	11
Lost Hills-Belridge	240	248	8+	15	5
Coalinga	815	804	11—	14	8
Santa Maria-Lompoc	235	237	2+	6	3
Ventura County and Newhall	442	444	2+	11	1
Los Angeles and Salt Lake	687	691	4+		
Whittier-Fullerton	568	613	45+		
Summerland	102	112	10+		
Watsonville	5	5			
Totals	6,106	6,532	426+	184	32

The proportion of heavy and light oil produced in the various fields is shown by the following figures, for which we are indebted to the Standard Oil Company. Oil below 18° Baumé may be considered as largely unrefinable, or fuel, oil; while the lighter oils yield varying amounts of refined products and a very large proportion of residuum or fuel oil. A very few years ago, the total amount of heavy oil was in excess of the light oil.

Production of Light and Heavy Oil by Fields.

Field	Under 18°, barrels	18° and over, barrels	Totals, barrels
Kern River	8,034,974		8,034,974
McKittrick	3,552,801		3,552,801
Midway-Sunset	10,363,414	28,954,679	39,318,093
Lost Hills-Belridge	11,133	4,307,417	4,318,550
Coalinga	5,968,295	7,579,864	13,548,159
Lompoc and Santa Maria	699,740	3,837,100	4,536,840
Ventura County and Newhall	101,397	934,908	1,036,305
Los Angeles and Salt Lake	1,979,938	130,195	2,110,133
Whittier-Fullerton	373,279	12,657,270	13,030,549
Summerland	53,000		53,000
Watsonville		27,375	27,375
Totals	31,137,971	58,428,808	89,566,779

Financial Results.

Financial results of the oil business during 1915 are shown by the following tables. The variations there indicated in the results, as differing from those of 1913 and 1914 (see Bulletins Nos. 69 and 70) are probably due to the larger number of wells shut in and the decrease in new development work, as a consequence of the unfavorable market

conditions in the first half of the year. Shut-in production, chiefly in the Coalinga field, was estimated at the end of the year at 12,000 barrels daily. The profitable, or dividend-paying companies received a slightly higher figure for their product than the average market price, probably due to the higher grade of oil produced by them. It is also noticeable that their production cost per barrel is usually lower than the average, due to the fact that their wells are more productive. Operating cost per well is not always lower for the dividend companies than others. Profitable operations seem to depend generally upon large wells, high-grade oil, and proximity to market. There is nothing to indicate that unnatural causes or manipulations have affected the profits of one producer against another. It should be particularly noted that both price and profits are greater in the Los Angeles and Orange County fields than in others. Doubtless this is largely due to the proximity to market.

There is a large supply of oil still in storage which, in many cases, might better be left in the ground and not subjected to losses by fire, leakage and evaporation as well as cost of storage. According to the Standard Oil Company, the stocks on hand on Dec. 31, 1915, amounted to 57,147,051 barrels, a decrease from the 58,526,274 barrels on hand Dec. 31, 1914. The figures are practically the same as those of the Independent Oil Producers Agency. The oft-repeated statement that this is less than a year's supply is of little moment in the face of a steady production which can supply the regular demand. It would be extremely interesting to know what portion of the stock on hand is low-grade oil. In view of the difference in value and marketableness of various grades of oil, the concerns publishing monthly statistics would render to the public and themselves a distinct service by showing something of the amounts of high and low gravity oil produced and stored.

Financial and Operating Condition of California Oil Fields, 1915.

Field	Number of companies considered	Per cent of total product of field	Capital	
			Cash	Property
Coalinga	39	27	$5,528,920	$33,004,906
Kern River	39	26	2,666,939	3,484,445
Midway	60	26	4,247,021	16,389,609
Sunset	17	25	746,424	4,593,113
McKittrick, Lost Hills-Belridge	18	50	722,143	9,652,569
Santa Maria, Lompoc, Summerland	9	20	2,448,283	634,385
Ventura	20	62	1,107,138	2,426,907
Los Angeles and Orange	19	23	3,166,541	6,509,724
Subtotals	221		$20,633,409	$76,695,658
Miscellaneous and marketing	15		63,991,364	31,485,032
Totals	236		$84,624,773	$108,180,690

Field	1910		1911		1912		1913		1914		1915	
	Companies	Value	Companies	Value	Companies	Value	Companies	Value	Companies	Value	Companies	Value
Coalinga	16	$1,366,243	14	$1,236,338	15	$1,154,328	17	$956,098	15	$1,048,840	13	$283,660
Kern River	24	392,472	22	389,822	26	454,095	19	361,444	20	205,258	20	187,962
Midway	10	562,763	18	1,076,285	19	1,128,161	14	520,520	25	917,981	23	853,376
Sunset	5	127,212	7	211,339	7	319,220	3	91,936	5	166,152	7	149,932
McKittrick, Belridge and Lost Hills	2	239,750	1	85,000	2	134,945	6	538,744	8	493,339	7	397,827
Santa Maria, Lompoc and Summerland	5	1,548,236	5	1,000,141	6	374,720	8	500,976	6	480,534	6	317,727
Ventura County	1	22,067	2	46,252	2	26,393	2	54,720	4	125,832	2	120,143
Los Angeles and Orange counties	13	1,427,908	12	1,288,034	12	878,478	14	3,015,159	13	2,453,981	14	863,677
Subtotals	76	$5,686,651	81	$5,333,211	89	$4,470,310	83	$6,039,597	96	$5,891,917	92	$3,174,304
Miscellaneous and marketing companies	6	2,981,598	5	2,830,403	7	4,401,218	8	9,509,009	9	9,384,308	13	9,926,044
Totals	82	$8,668,249	86	$8,163,614	96	$8,871,558	91	$15,548,606	105	$15,276,225	105	$13,100,348

Prices of Light and Heavy Oil and Operating Data.

Field	Price				Operating data					
					All companies			Dividend companies		
	Under 18° Baume, (cents)	Over 18° Baume, (cents)	Average price, (cents)	Price to dividend companies, (cents)	Barrels per well per day, yield	Operating cost per well day, (dollars)	Operating cost, cents, per barrel	Barrels per well per day, yield	Operating cost per well day, (dollars)	Operating cost, cents, per barrel
Coalinga	30.5	83.6	54.5	42.7	36.2	12.53	34.6	26.6	4.44	16.7
Kern River	31.1	----------	31.1	31.7	11.5	1.53	13.3	15.6	1.34	8.6
Midway	38.4	49.9	43.3	47.2	49.0	8.72	17.8	71.9	15.27	21.5
Sunset	33.4	39.2	38.5	36.5	62.2	8.65	13.9	162.0	14.42	8.9
McKittrick, Belridge and Lost Hills	36.4	46.1	42.6	42.2	38.2	3.90	10.2	38.5	3.58	9.3
Santa Maria, Lompoc and Summerland	37.1	72.0	61.1	60.7	33.9	3.42	10.1	40.3	3.47	8.6
Ventura	42.7	90.1	85.5	93.5	16.1	5.06	31.4	16.8	3.63	21.6
Los Angeles and Orange counties	50.3	59.0	56.5	57.3	18.1	2.84	15.7	27.2	3.43	12.6

Proved Oil Land.

The present extent of proved oil land in California has been determined recently by the State Mining Bureau in the most accurate and detailed study ever given to the subject. The total is 126 square miles, or 80,702 acres, of which 55,842 acres are in Kern County alone. Fresno County is second on the list with 12,218 acres, and Santa Barbara County third with 6,030 acres. The other counties in order of their rank are Orange, Los Angeles, Ventura, San Luis Obispo, and Santa Clara. It is worthy of notice that the total area of proved oil land is most insignificant in comparison with the area of the entire state, being less than one one-thousandth part, and yet the oil business is one of the state's most important industries.

Estimates of the total amount of oil which can be recovered from the land are little better than pure guesses but it does seem most probable that the average acre will ultimately yield much less than fifty thousand barrels.

The areas of the various fields are as follows:

By counties	Acres	By fields	Acres
Fresno	12,218	Coalinga	12,218
Kern	55,842	Lost Hills-Belridge	3,115
Santa Barbara	6,030	McKittrick	1,086
Ventura	749	Sunset-Midway	44,839
Los Angeles	2,326	Kern River	6,974
Orange	3,305	Santa Maria and Lompoc	5,900
San Luis Obispo	202	Summerland	130
Santa Clara	30	Ventura	749
		Salt Lake	949
		Newhall	117
		Los Angeles City	380
		Whittier-Fullerton	4,185
		Arroyo Grande	30
		Sargent	30
	80,702		80,702

CHAPTER THREE.

METALS.

The total value of metals produced in California during 1915 was $34,577,214. The chief of these is, and always has been, gold, followed in order in 1915 by copper, zinc, quicksilver, tungsten, silver, lead, manganese, antimony, platinum and iron. Deposits of ores of molybdenum, nickel and vanadium are also to be found in the state, although for 1915 there was no commercial output of these materials.

California leads all states in the Union in her gold production and the precious metal is widely distributed throughout the state. Thirty of the fifty-eight counties contain actively operated gold mines or dredges.

Copper, which is second in importance among the metals of the state, occurs in the following general districts: the Shasta County belt, which is by far the most important; the Coast Range deposits, extending more or less continuously from Del Norte in the north to San Luis Obispo County in the south; the Sierra Nevada foothill belt, starting in Plumas and running in a general southerly direction through the Mother Lode counties and ending in Kern; the eastern belt in Mono and Inyo counties; and the southern belt, in San Bernardino, Riverside, and San Diego counties.

Silver is not generally found alone in the state, but is associated to a greater or less extent with gold, copper, lead, and zinc. Quicksilver has for many years been one of the state's staple products and California supplies about 80 per cent of the nation's output of this metal.

Tungsten is found in but few other localities of importance.

Large deposits of iron ore have long been known in many sections of the state, but for various economic reasons this branch of the mineral industry is still in its infancy here.

A comparison of the metal output with that of 1914 is afforded by the following table:

Metal	1914		1915		Increase+ Decrease− Value
	Amount	Value	Amount	Value	
Antimony ore			510 tons	$35,666	$35,666+
Copper	30,491,535 lbs.	$4,055,375	40,968,966 lbs.	7,169,567	3,114,192+
Gold		20,653,496		22,442,296	1,788,800+
Iron ore	1,436 tons	5,128	724 tons	2,584	2,544—
Lead	4,697,400 lbs.	183,198	4,796,299 lbs.	225,426	42,228+
Manganese ore	150 tons	1,500	4,013 tons	49,098	47,598+
Platinum	463 oz.	14,816	667 oz.	21,149	6,333+
Quicksilver	11,373 flsks.	557,846	14,199 flsks.	1,157,449	599,603+
Silver		813,938		851,129	37,191+
Tungsten conc.	375 tons	180,575	962 tons	1,005,467	824,892+
Zinc	399,641 lbs.	20,381	13,043,411 lbs.	1,617,383	1,597,002+
Totals		$26,486,253		$34,577,214	
Net increase					$8,090,961+

ALUMINUM.

Bibliography: Bulletin 38.

No deposits of pure bauxite have been discovered in the state, although from time to time small quantities of the impure material have been the foundation of extravagant reports regarding such discoveries.

ANTIMONY.

Bibliography: State Mineralogist Reports XII, XIII. Bulletin 38.

Antimony is known to exist in a number of places in California, having been reported from Kern, Inyo, Riverside, San Benito, and Santa Clara counties. The Kern County deposits, some of which carry metallic antimony, are possibly the best known, and efforts were made to work some of them before California was a part of the United States. The commonest occurrence is in the form of the sulphide, stibnite. No continuous production, however, has been maintained, the output for 1915 being the first reported since 1901.

From the low point of 5.44¢ to 7.11¢ per pound, according to brand in July, 1914, the price of antimony rose gradually, though not steadily to 40¢ at the end of 1915. American antimony, for the first time in many years, appeared on the market in competition with the Chinese and Japanese product. From $1.00 to $2.10 per unit was paid for ore, and at first a minimum of 50% accepted; but, later, some lower grade ore was smelted.

During 1915 in California there was mined and sold a total of 510 tons of antimony ore, valued at $35,666, by five producers in Kern County and one each from Inyo and San Benito counties. The Wild Rose mine in Inyo County made the largest individual output.

The production by years since 1887 has been as follows:

Year	Tons	Value	Year	Tons	Value
1887	75	$15,500	1898	40	$1,200
1888	100	20,000	1899	75	13,500
1893	50	2,250	1900	70	5,700
1894	150	6,000	1901	50	8,350
1895	33	1,485	1915	510	35,666
1896	17	2,320			
1897	20	3,500	Totals	1,190	$115,471

COPPER.

Bibliography: State Mineralogist Reports VII, XIII. Bulletins 23 and 50.

Copper is one of the staple mineral products of the state, being produced chiefly in Shasta County, with smaller amounts coming from Calaveras, Placer and Plumas counties. In 1915, some yield in greater

or less amount, was reported from a total of 25 counties. The total production for the year was 40,968,966 pounds, valued at $7,169,567; which is an increase in both amount and value over the previous year. The European war caused a decrease in copper mining for a short time, but followed by renewed activity. The same cause has also raised the price from the 1914 average of 13.3¢ to 17.5¢ per pound for 1915, the closing December figure being 23.5¢, and still rising.

Further efforts have been made during the past year in the improvement of method of handling the smelter smoke. Flotation concentration is being successfully employed by the Engels Copper Company in Plumas County, and by the Calaveras Copper Company in Calaveras County.

Distribution of the output, by counties, for 1915, was as follows:

County	Pounds	Value
Amador	4,185	$732
Butte	11	2
Calaveras	4,031,149	705,451
El Dorado	417	73
Fresno	65,903	11,533
Glenn	746	131
Imperial	65	11
Inyo	154,722	27,076
Kern	1,047	183
Madera	40,294	7,051
Mariposa	38,630	6,760
Nevada	1,817	318
Orange	4	1
Plumas	3,164,496	553,787
Riverside	23,825	4,169
San Bernardino	209,440	36,652
San Diego	3,008	526
Shasta	30,828,917	5,395,060
Tuolumne	27,667	4,842
Humboldt, Lake, Placer, Siskiyou, Trinity*	2,372,623	415,209
Totals	40,968,966	$7,169,567

*Combined to conceal output of individual mines in each.

Amount and value of copper production in California annually since such records have been compiled by the State Mining Bureau is given in the following tabulation:

Year	Pounds	Value	Year	Pounds	Value
1887	1,600,000	$192,000	1903	19,113,861	$2,520,997
1888	1,570,021	235,303	1904	29,974,154	3,969,995
1889	151,505	18,180	1905	16,997,489	2,650,605
1890	23,347	3,502	1906	28,726,448	5,522,712
1891	3,397,455	424,675	1907	32,602,945	6,341,387
1892	2,980,944	342,808	1908	40,868,772	5,350,777
1893	239,682	21,571	1909	65,727,736	8,478,142
1894	738,594	72,486	1910	53,721,032	6,680,641
1895	225,650	21,901	1911	36,838,024	4,604,753
1896	1,992,844	199,519	1912	34,169,997	5,638,049
1897	13,638,626	1,540,666	1913	34,471,118	5,343,023
1898	21,543,229	2,475,168	1914	30,491,535	4,055,375
1899	23,915,486	3,990,534	1915	40,968,966	7,169,567
1900	29,515,512	4,748,242			
1901	34,931,788	5,501,782	Totals	628,996,922	$91,351,335
1902	27,860,162	3,239,975			

GOLD.

Bibliography: All State Mineralogist Reports. Bulletins 36, 45, 57.

Gold is one of the most important mineral products of California, and its early discovery undoubtedly was the prime cause of the rapid development of the state. There is a marked tendency toward increased activity in gold mining, as investors realize that many of the mines and prospects have not been exhausted. It is absolutely necessary that owners of prospects and small mines, who wish to dispose of their property or see it developed, should realize that most large investments of that sort are made only after thorough investigation. Frequently, demands for large cash payments have turned away capitalists who would otherwise have been willing to risk an equal amount in development work. Increased activity is noted in practically all of the gold districts.

The State Mining Bureau has never independently collected statistics of gold, platinum and silver production, as there is no necessity for duplicating the very thoroughly organized work of the U. S. Geological Survey covering those metals. The data here given relative to these three metals has been received through the courtesy of Mr. Charles G. Yale, Statistician in charge of the San Francisco branch office of the Division of Mineral Resources. Anyone wishing fuller details of the production of these metals may obtain the same by applying to the

U. S. Geological Survey, Washington, D. C., or to Room 305, U. S. Custom House, San Francisco, Cal., for a copy of the "separate" on the subject.

"There was a decrease in California in 1915 in the number of productive mines, but an increase in yield of gold, silver, copper, lead and zinc. * * * In 1915 there were 608 properties reporting production, of which 321 were "deep" (vein) mines and 287 were placers. The producing deep mines of 1915 may be classified by metallic product as follows: Gold, 237; copper, 43; silver, 11; silver-lead, 3; lead, 21; and zinc, 6. Of the placer mines, 96 were hydraulic; 58 were dredge; 61 were drift; and 73 were surface or sluicing. * * *

"The siliceous ore yielded an average per ton in gold and silver of $5.68; the copper ore, $1.71; the silver ore, $63.77; the lead ore, $6.85; the silver-lead ore, $64.32; and the zinc ore, $3.09. The average per ton in gold and silver from all ores treated in the state in 1915 was $4.89.

"The 3,002,779 tons of ore of all classes treated in California in 1915 yielded 669,204.22 fine ounces of gold, valued at $13,833,679; 1,640,888 fine ounces of silver, valued at $831,930; 40,751,625 pounds of copper, valued at $7,131,534; 4,579,245 pounds of lead, valued at $215,225; and 13,094,032 pounds of zinc, valued at $1,623,660.

* * * * * * *

"The total production of gold in California in 1915 was 1,085,646.05 fine ounces, valued at $22,442,296, as compared with 999,112.85 fine ounces, valued at $20,653,496 in 1914, * * * or 8.66% increase for 1915. * * * Of the deep mine gold, 644,044.19 fine ounces, valued at $13,313,575 was derived from siliceous ores; 23,797.60 fine ounces, valued at $491,940, was derived from copper ore; 1,110.26 fine ounces, valued at $22,951, from lead ore; 95.98 fine ounces, valued at $1,984, from silver ore; 29.21 fine ounces, valued at $604, from silver-lead ores; and 126.98 fine ounces, valued at $2,625, from zinc ores.

"The placer yield of gold in 1915 was 416,441.83 fine ounces, valued at $8,608,617. Of this, $420,770 was derived from 96 hydraulic mines; $7,796,465 from 58 dredges; $272,955 from 61 drift mines; and $118,427 from 72 surface or sluicing mines. The placer mines produced 38.36% of the total gold yield for 1915, and the deep mines 61.64% as compared with 43.97% for the placers and 56.03% for the deep mines in 1914. The dredges produced 34.74% of the total gold yield from all sources in 1915, and 90.57% of the total placer gold. The hydraulic mines produced 4.89% of the total placer gold for the year.

"The largest production of gold in California in 1915 came from Amador County. The leading hydraulic mining county was Siskiyou; the greatest producer of gold from drift mines was Placer; the largest producer of gold from dredges was Yuba; and the largest producer from surface or sluicing mines was Butte. The largest increase in total yield of gold in 1915, as compared with 1914, was in Amador, an increase of $812,123"; followed by Kern, El Dorado and Mariposa in the order named, each with an increase in excess of a quarter of a million.

The gold production of California for 1915 was distributed, by counties, as follows:

County	Value	County	Value
Amador	$3,894,125	Nevada	$3,466,722
Butte	1,545,976	Placer	414,319
Calaveras	1,391,131	Plumas	167,440
Del Norte	1,018	Riverside	10,769
El Dorado	401,288	Sacramento	2,131,813
Fresno	4,151	San Bernardino	416,967
Humboldt	15,947	San Diego	1,364
Imperial	14,369	Shasta	1,120,848
Inyo	317,905	Sierra	726,362
Kern	983,319	Siskiyou	426,716
Lake, Merced and Stanislaus*	274,435	Trinity	441,846
Madera	11,214	Tuolumne	1,058,103
Mariposa	385,577	Yuba	2,703,710
Modoc	7,557		
Mono	107,302	Total	$22,442,296

*Combined to conceal output of a single property in each.

Total Gold Production of California.

The following table was compiled by Chas. G. Yale, of the Division of Mineral Resources, U. S. Geological Survey, but for a number of years statistician of the California State Mining Bureau and the U. S. Mint at San Francisco. The authorities chosen for certain periods were: J. D. Whitney, state geologist of California; John Arthur Phillips, author of "Mining and Metallurgy of Gold and Silver" (1867); U. S. Mining Commissioner R. W. Raymond; U. S. Mining Commissioner J. Ross Browne; Wm. P. Blake, Commissioner from California to the Paris Exposition, where he made a report on "Precious Metals" (1867); John J. Valentine, author for many years of the annual report on precious metals published by Wells Fargo & Company's Express; and Louis A. Garnett, in the early days manager of the San Francisco refinery, where records of gold receipts and shipments were kept. Mr. Yale obtained other data from the reports of the director of the U. S. Mint and the director of the U. S. Geological Survey. The authorities referred to, who were alive at the time of

the original compilation of this table in 1894, were all consulted in person or by letter by Mr. Yale with reference to the correctness of their published data, and the final table quoted was then made up.

The figures of the last eleven years are those prepared by the U. S. Geological Survey:

Year	Value	Year	Value
1848	$245,301	1883	$24,316,873
1849	10,151,360	1884	13,600,000
1850	41,273,106	1885	12,661,044
1851	75,938,232	1886	14,716,506
1852	81,294,700	1887	13,588,614
1853	67,613,487	1888	12,750,000
1854	69,433,931	1889	11,212,913
1855	55,485,395	1890	12,309,793
1856	57,509,411	1891	12,728,869
1857	43,628,172	1892	12,571,900
1858	46,591,140	1893	12,422,811
1859	45,846,599	1894	13,923,281
1860	44,095,163	1895	15,334,317
1861	41,884,995	1896	17,181,562
1862	38,854,668	1897	15,871,401
1863	23,501,736	1898	15,906,478
1864	24,071,423	1899	15,336,031
1865	17,930,858	1900	15,863,355
1866	17,123,867	1901	16,989,044
1867	18,265,452	1902	16,910,320
1868	17,555,867	1903	16,471,264
1869	18,229,044	1904	19,109,600
1870	17,458,133	1905	19,197,043
1871	17,477,885	1906	18,732,452
1872	15,482,194	1907	16,727,928
1873	15,019,210	1908	18,761,559
1874	17,264,836	1909	20,237,870
1875	16,876,009	1910	19,715,440
1876	15,610,723	1911	19,738,908
1877	16,501,268	1912	19,713,478
1878	18,839,141	1913	20,406,958
1879	19,626,654	1914	20,653,496
1880	20,030,761	1915	22,442,296
1881	19,223,155		
1882	17,146,416	Total	$1,631,183,696

IRIDIUM (see under Platinum).

IRON ORE.

Bibliography: State Mineralogist Reports II, IV, V, X, XII, XIII. Bulletin 38.

Iron ore to the extent of 724 tons, valued at $2,584, was produced in California during the year 1915. It was utilized in the production of ferro-manganese and ferro-chrome by electric furnace reduction.

There are considerable deposits of iron ore known in California, notably in Shasta, Madera and San Bernardino counties, but production has never amounted to much, on account of our having no economic

supply of coking coal. Developments along the line of electrical smelting, or discoveries making valuable our petroleum fuel, would lead to considerable increase of iron mining in California.

Total iron ore production in the state, with annual amounts and values, is as follows:

Year	Tons	Value	Year	Tons	Value
1893	250	$2,000	1912	2,508	$2,508
1894	200	1,500	1913	2,343	4,485
1907	400	400	1914	1,436	5,128
1909	108	174	1915	724	2,584
1910	579	900			
1911	558	558	Totals	9,106	$20,237

LEAD.

Bibliography: State Mineralogist Reports IV, VIII, X.

Lead was produced during 1915, to the extent of 4,796,299 pounds, which at 4.7¢ per pound was valued at $225,426, being an increase both in amount and value as compared to the previous year. The principal yield comes from Inyo County, followed by Shasta, San Bernardino and Kern in the order named. The ores are mined and shipped to smelters. On account of the European war, the price increased from the 3.9¢ per pound average of 1914, to 4.7¢ as noted above.

County returns for 1915, showing amounts and values, were:

County	Pounds	Value	County	Pounds	Value
Amador	523	$25	Riverside	32,072	$1,507
Butte	90	4	San Bernardino	169,183	7,952
Calaveras	163	8	San Diego	23	1
Inyo	4,323,639	203,211	Shasta	180,936	8,504
Kern	84,371	3,965	Siskiyou	188	9
Merced	680	32	Tuolumne	1,779	84
Nevada	1,567	74			
Orange	364	17			
Placer	711	33	Totals	4,796,299	$225,426

Statistics on lead production in California were first compiled by this Bureau in 1887. Amount and value of the output, annually, with total figures, to date, are given in the following table:

Year	Tons	Value	Year	Tons	Value
1887	580	$52,200	1903	55	$3,960
1888	450	38,250	1904	62	5,270
1889	470	35,720	1905	266	25,083
1890	400	36,000	1906	169	19,307
1891	570	49,020	1907	164	16,690
1892	680	54,400	1908	562	46,663
1893	333	24,975	1909	1,343	144,897
1894	475	28,500	1910	1,508	134,082
1895	796	49,364	1911	701	63,173
1896	646	38,805	1912	685	61,653
1897	298	20,264	1913	1,820	160,202
1898	328	23,907	1914	2,349	183,198
1899	360	30,642	1915	2,398	225,426
1900	520	41,600			
1901	360	28,820	Totals	19,523	$1,654,301
1902	175	12,230			

MANGANESE.

Bibliography: State Mineralogist Reports XII, XIII. Bulletins 38, 67; U. S. G. S., Bull. 427.

In the statistical reports of 1913 and 1914, manganese ore was included in the "industrial materials" list. We have this year made a transfer, and now place it under "metals," because by far the greater tonnage of manganese ore is utilized in the preparation of ferro-manganese and employed in the steel industry for its metal content. Though its other uses may be classed as "chemical," the tonnage thus consumed is relatively smaller. Its chemical uses are as a decolorizer or oxidizer in glass manufacture, and as a constituent in electric dry batteries. The chemical uses require a much higher grade of ore than the steel industry. For steel purposes, an iron content is acceptable, but manganese should exceed 40%. Silica should be under 8%, though higher has been taken during the present scarcity of foreign supplies. Phosphorus should be under 0.20%. For electric dry cells, the iron content should be under 1.5%, Fe_2O_3, and SiO_2 under 6%. For glass making, the manganese should be practically free of iron.

The bulk of the 1915 product was utilized in California in making ferro-manganese by electric furnace, though some of the year's output was sent east. Some "chemical" ore was shipped in 1915 from Mendocino County, and shipments are also at present being made from a mine in San Bernardino County. For many years the principal producing section has been the Livermore-Tesla district, in Alameda and San Joaquin counties, although exceeded in 1915 by Mendocino. Manganese is reported to exist in many localities in the state; but past pro-

duction, particularly since the discontinuance of the chlorination process in the metallurgy of gold, has been relatively unimportant until the present activity. The war in Europe has affected the manganese ore market, as it has a number of other minerals in which California is also to the fore. Prices have ranged from $12 to $18 per ton for the lower grades, to $50 to $60 for chemical grades.

The production of manganese ore in California for 1915 amounted to 4,013 tons of all grades, having a total value of $49,098 at the mines. It was distributed by counties as follows:

County	Tons	Value
Alameda	319	$3,652
Mendocino	2,858	23,036
San Joaquin	460	7,400
Glenn and San Bernardino*	376	15,010
Totals	4,013	$49,098

*Combined to conceal output of a single mine in each.

The production of manganese ore in California annually since 1887 follows:

Year	Tons	Value	Year	Tons	Value
1887	1,000	$9,000	1903	1	$25
1888	1,500	13,500	1904	60	900
1889	53	901	1905	----	----
1890	386	3,176	1906	1	30
1891	705	3,830	1907	1	25
1892	300	3,000	1908	321	5,785
1893	270	4,050	1909	3	75
1894	523	5,512	1910	265	4,235
1895	880	8,200	1911	2	40
1896	518	3,415	1912	22	400
1897	504	4,080	1913	----	----
1898	440	2,102	1914	150	1,500
1899	295	3,165	1915	4,013	49,098
1900	131	1,310			
1901	425	4,405	Totals	13,639	$138,899
1902	870	7,140			

MOLYBDENUM.

Bibliography: Bulletin 67, "Molybdenite."

Molybdenum is used to a limited extent as an alloy in the steel industry, and also in certain forms of electrical apparatus. Deposits of disseminated molybdenum ores have been observed in several localities in California, and also in small masses associated with copper ore in one district in Plumas County. No commercial production has been made to date, except that a small tonnage was mined in Plumas County in the latter part of the year 1915, but has not been marketed.

NICKEL.

Bibliography: Report on San Diego County, 1914.

Nickel occurs in the Friday Copper Mine in the Julian District, San Diego County. The ore is a nickel-bearing pyrrhotite, with some associated chalcopyrite. Some ore was mined during 1915 in the course of development work, but was not treated nor disposed of, as they were unable to get any smelter to handle it for them.

OSMIUM (see under Platinum).

PALLADIUM (see under Platinum).

PLATINUM.

Bibliography: State Mineralogist Reports XII, XIII. Bulletins 38, 45, 67.

Platinum is a by-product from California's placer operations for gold, and is obtained in part by hydraulic mines in Trinity County, and in the other counties by the gold dredges. As explained under the heading of Gold, the State Mining Bureau does not collect the statistics on platinum, we being indebted to the courtesy of Mr. Chas. G. Yale, of the Division of Mineral Resources, U. S. Geological Survey, for these figures also.

The production for 1915 amounted to 667 ounces of crude platinum, valued at a total of $21,149. Crude platinum varies considerably in its purity. That marketed during the year 1914,[6] is stated to have averaged 51% platinum, 3% iridium, and 30% iridosmine or osmiridium. Some platinum is also recovered in the electrolytic refining of blister copper. It has been found[7] that blister copper from several smelters in the United States carries from 0.342 oz. to 1.825 oz. platinum and from 0.607 oz. to 4.402 oz. palladium per 100 tons of blister copper treated; that from Shasta County, California, yielding 1.320 oz. platinum and 0.607 oz. palladium. Iron in greater or less amount is always alloyed naturally with native platinum, and usually some iridium and osmium.

For 1915, the distribution, by counties, was as follows:

County	Ounces	Value
Butte	126	$3,997
Sacramento	196	6,217
Trinity	13	435
Yuba	132	4,174
Calaveras, Merced, Plumas and Stanislaus*	200	6,326
Totals	667	$21,149

[6]U. S. G. S., Min. Res., 1914, Pt. I, p. 336.
[7]Trans. Am. Inst. Min. Eng., vol. 47, pp. 217-218, 1913.
*Combined to conceal output of a single dredge in each.

Russia produces about 90% of the world's output of platinum. Because of this source being cut off at present, the domestic price is practically double what it was before the war. California's yield for 1915 shows an increase in both amount and value, as compared to 1914. There have been occasional reports of platinum in California being found in vein materials, but as yet no authentic case has come to the notice of the laboratory of the State Mining Bureau.

The annual production and value since 1887, have been as follows:

Year	Ounces	Value	Year	Ounces	Value
1887	100	$100	1903	70	$1,052
1888	500	2,000	1904	123	1,849
1889	500	2,000	1905	200	3,320
1890	600	2,500	1906	91	1,617
1891	100	500	1907	300	6,255
1892	80	440	1908	706	13,414
1893	75	517	1909	416	10,400
1894	100	600	1910	337	8,386
1895	150	900	1911	511	14,873
1896	162	944	1912	603	19,731
1897	150	900	1913	368	17,738
1898	300	1,800	1914	463	14,816
1899	300	1,800	1915	667	21,149
1900	400	2,500			
1901	250	3,200			
1902	39	468	Totals	8,661	$156,099

QUICKSILVER.

Bibliography: State Mineralogist Reports IV, X, XII, XIII. Reports on Colusa et al., counties, 1915. Bulletin 27. U. S. G. S., Monograph XIII.

Quicksilver was produced in 12 counties in 1915, to the amount of 14,199 flasks, valued at $1,157,449, which is an increase both in number of flasks and value over the year 1914. The European war caused a considerable rise in the price of quicksilver, due to the prohibition of exports from Austria and Italy, and the retention of the Spanish output in England. Immediate steps were taken by many to reopen old quicksilver properties which had been idle for many years. The coming year will show a still further advance in production. A total of approximately 700 men were employed in the quicksilver mines of California in 1915.

The following table of monthly San Francisco quotations per flask of 75 pounds, will indicate the decided change in the status of quicksilver during the year 1915, as compared with the pre-war price of about $37 per flask. As San Francisco is the primary domestic market for quicksilver, the average yearly quotations on this market have always been used by the State Mining Bureau (and the U. S. Geological Survey,

also) in calculating the value of the state's output of this metal. The 1914 figure was $49.05 per flask. However, because in 1915 there was considerable speculation in quicksilver by parties other than the actual producers, and the price changes were often rapid, so that quotations did not always mean sales, we have in this case taken for the average value the average actual sales as reported to us by the producers. This gives us an average value of $81.52 per flask for the year 1915, instead of the $85.80 average of quotations.

San Francisco Prices of Quicksilver, 1915.

Month	Average price	Month	Average price
January	$51 90	July	$95 00
February	60 00	August	93 75
March	78 00	September	91 00
April	77 50	October	92 90
May	75 00	November	101 50
June	90 00	December	123 00

The important uses of quicksilver are the recovery of gold and silver by amalgamation, and in the manufacture of fulminate for explosive caps, of drugs, of electric appliances, and of scientific apparatus. By far the greatest consumption is in the first two mentioned.

Though some domestic yield of this metal is now obtained from Texas, Nevada and Arizona, the bulk of the output still comes from California.

The distribution of the 1915 product, by counties, was:

County	Amount, flasks	Value
Lake	492	$41,660
Napa	507	45,224
San Benito	6.291	475,370
San Luis Obispo	1,473	125,542
Santa Clara	4,386	376,319
Sonoma	159	21,793
Kings, Monterey, Santa Barbara, Solano, Stanislaus and Yolo*	891	71,541
Totals	14,199	$1,157,449

*Combined to conceal output of a single mine in each.

Total Quicksilver Production of California.

The total amount and value of the quicksilver production of California, as given in available records, is shown in the following tabulation. Though the New Almaden mine in Santa Clara County was first worked in 1824, and has been in practically continuous operation since 1846 (though the yield was small the first two years), there are no

available data on the output earlier than 1850. Previous to June, 1904, a "flask" of quicksilver contained 76½ pounds, but since that date 75 pounds. In compiling this table the following sources of information were used: For 1850–1883, table by J. B. Randol, in Report of State Mineralogist, IV, p. 336; 1883–1893, U. S. Geological Survey reports; 1894 to date, statistical bulletins of the State Mining Bureau; also State Mining Bureau, Bulletin 27, "Quicksilver Resources of California," 1908, p. 10:

Year	Flasks	Value	Average price per flask	Year	Flasks	Value	Average price per flask
1850	7,723	$768,052	$99 45	1884	31,913	$973,347	$30 50
1851	27,779	1,859,248	66 93	1885	32,073	986,245	30 75
1852	20,000	1,166,600	58 33	1886	29,981	1,064,326	35 50
1853	22,284	1,235,648	55 45	1887	33,760	1,430,749	42 38
1854	30,004	1,663,722	55 45	1888	33,250	1,413,125	42 50
1855	33,000	1,767,150	53 55	1889	26,464	1,190,880	45 00
1856	30,000	1,549,500	51 65	1890	22,926	1,203,615	52 50
1857	28,204	1,374,381	48 73	1891	22,904	1,036,406	45 25
1858	31,000	1,482,730	47 83	1892	27,993	1,139,595	40 71
1859	13,000	820,690	63 13	1893	30,164	1,108,527	36 75
1860	10,000	535,500	53 55	1894	30,416	934,000	30 70
1861	35,000	1,471,750	42 05	1895	36,101	1,337,131	37 04
1862	42,000	1,526,700	36 35	1896	30,765	1,075,449	34 96
1863	40,531	1,705,544	42 08	1897	26,691	993,445	37 28
1864	47,489	2,179,745	45 90	1898	31,092	1,188,626	38 23
1865	53,000	2,432,700	45 90	1899	29,454	1,405,045	47 70
1866	46,550	2,473,202	53 13	1900	26,317	1,182,786	44 94
1867	47,000	2,157,300	45 90	1901	26,720	1,285,014	48 46
1868	47,728	2,190,715	45 90	1902	29,552	1,276,524	43 20
1869	33,811	1,551,925	45 90	1903	32,094	1,335,954	42 25
1870	30,077	1,725,818	57 38	1904	*28,876	1,086,323	37 62
1871	31,686	1,999,387	63 10	1905	24,655	886,081	35 94
1872	31,621	2,084,773	65 93	1906	19,516	712,334	36 50
1873	27,642	2,220,482	80 33	1907	17,379	663,178	38 16
1874	27,756	2,919,376	105 18	1908	18,039	763,520	42 33
1875	50,250	4,228,538	84 15	1909	16,217	773,788	47 71
1876	75,074	3,303,256	44 00	1910	17,665	799,002	45 23
1877	79,396	2,961,471	37 30	1911	19,109	879,205	46 01
1878	63,880	2,101,652	32 90	1912	20,600	866,024	42 04
1879	73,684	2,194,674	29 85	1913	15,661	630,042	40 23
1880	59,926	1,857,706	31 00	1914	11,373	557,846	49 05
1881	60,851	1,815,185	29 83	1915	14,199	1,157,449	81 52
1882	52,732	1,488,624	28 23				
1883	46,725	1,343,344	28 75	Totals	2,091,919	$97,492,669	

*Flasks of 75 lbs. since June, 1904; of 76½ lbs. previously.

SILVER.

Bibliography: State Mineralogist Reports IV, VIII, XII.

Silver in California is produced largely as a by-product, associated with copper, lead, zinc and gold ores. As explained under the heading of Gold, the following figures are those of the U. S. Geological Survey. The average price of silver during 1915 was 50.7¢ per ounce at New York, as compared with 54.8¢ in 1914.

"The yield of silver in California in 1915 was 1,678,756 fine ounces, valued at $851,129, an increase in quantity of 206,897 ounces and an increase of $37,191 in value. The larger portion of the output, 1,445,037 ounces, valued at $732,634, was derived from crude smelting ores. The output of siliceous ore, both milled and smelted, yielded 272,849 fine ounces, valued at $138,334. The largest output of silver came, as usual, from Shasta County, which produced * * * a total of 906,441 fine ounces, valued at $459,566," mainly from copper ores, with smaller amounts from siliceous ores and placers. "Inyo County followed Shasta in yield of silver in 1915, the output being 252,257 ounces, valued at $127,894, * * * nearly equally divided between lead ores and zinc ores. The total silver derived from deep mines of all classes in California in 1915 was 1,640,888 ounces, valued at $831,930. The silver obtained with gold in placer mining in the state in 1915 was 37,868 ounces, valued at $19,199. The largest producer of placer silver was Yuba County, with 10,357 ounces, valued at $5,251."

The distribution of the 1915 silver yield, by counties, was as follows:

County	Value	County	Value
Amador	$20,409	Nevada	$23,762
Butte	3,433	Placer	24,543
Calaveras	53,298	Plumas	19,025
Del Norte	6	Riverside	1,522
El Dorado	1,353	Sacramento	3,151
Fresno	246	San Bernardino	64,165
Humboldt	62	San Diego	9
Imperial	42	Shasta	459,566
Inyo	127,894	Sierra	3,156
Kern	13,316	Siskiyou	2,081
Lake, Mereed and Stanislaus*	1,558	Trinity	3,470
Madera	2,126	Tuolumne	13,480
Mariposa	2,175	Yuba	5,254
Modoc	104		
Mono	1,923	Total	$851,129

*Combined to conceal output of a single property in each.

The value of the silver produced in California each year since 1887, is as follows:

Year	Value	Year	Value
1887	$1,632,003	1903	$517,444
1888	1,700,000	1904	873,525
1889	754,793	1905	678,494
1890	1,060,613	1906	817,830
1891	953,157	1907	751,646
1892	463,602	1908	873,057
1893	537,157	1909	1,091,092
1894	297,332	1910	993,646
1895	599,789	1911	673,336
1896	422,463	1912	799,584
1897	452,789	1913	832,553
1898	414,055	1914	813,938
1899	504,012	1915	851,129
1900	1,510,344		
1901	1,229,356		
1902	616,412	Total	$23,715,151

TIN.

Bibliography: Bulletin 67, "Cassiterite."

Tin is not at present produced in California; but during 1891–2, there was some production from a small deposit near Corona, in Riverside County, as tabulated below. Small quantities of stream tin have been found in some of the placer workings in northern California, but never in paying amounts.

Early in the current year, two new occurrences have been noted in northern San Diego County. Crystals of cassiterite have been found there, associated with blue tourmaline crystals, amblygonite and beryl. No commercial quantity has been developed, only small pockets having been taken out, as yet; but the prospect is an interesting one.

Total output of tin in California:

Year	Pounds	Value
1891	125,289	$27,564
1892	126,000	32,400
Totals	251,289	$59,964

TUNGSTEN.

Bibliography: Bulletins 38, 67.

The metal, tungsten, is used mainly in the steel industry and in the manufacture of electrical appliances, including the well-known tungsten filament lamps. Because of its resistance to corrosion by acids, it is valuable in making certain forms of chemical apparatus. In the form of tungstic acid, it is stated to be used to toughen silk and linen fabrics for certain purposes.

Tungsten ore is produced in California principally in the Atolia-Randsburg district in San Bernardino and Kern counties, with small amounts coming from Nevada County and from the district near Goffs, in eastern San Bernardino. Most of the California tungsten ore is scheelite (calcium tungstate), though wolframite (iron-manganese tungstate) and hübnerite (manganese tungstate) also occur. The value of the ore is based upon the content of tungstic trioxide (WO_3), and quotations are commonly made per unit (each 1%) of WO_3 present.

In 1915 there were marketed 962 tons of high grade ore and concentrates, valued at $1,005,467, which is more than double the tonnage and over five times the value of the 1914 output. Previous to 1915, a single company produced almost all of California's tungsten. During the latter part of 1915, and the early months of 1916, because of

the high prices prevailing, prospecting was much stimulated, and the known tungsten-bearing areas have been considerably extended both in San Bernardino and Kern counties. Shipments have also begun from mines opened up in the Clark Mountain and New York Mountains districts in eastern San Bernardino County. In these latter areas, wolframite and hübnerite are the principal ores, with some scheelite, while at Atolia it is scheelite only. Scheelite ore is also being developed in Inyo County near Bishop, and two concentrating mills are under construction. The Nevada County ore is also scheelite.

Distribution of the 1915 output was as follows:

County	Tons	Value
Kern and Nevada*	98	$164,520
San Bernardino	864	840,947
Totals	962	$1,005,467

*Combined to conceal output of a single mine in Nevada County.

The annual value of tungsten produced in California since the inception of the industry is given herewith:

Year	Value	Year	Value
1905	$18,800	1912	$206,000
1906	189,100	1913	234,673
1907	120,587	1914	180,575
1908	37,750	1915	1,005,467
1909	190,500		
1910	208,245	Total	$2,519,403
1911	127,706		

VANADIUM.

Bibliography: Bulletin 67.

No commercial production of vanadium has as yet been made in California. Occurrences of this metal have been found near Goffs in San Bernardino County, and two companies have done considerable development work recently in the endeavor to open up paying quantities. One mill has been built, and another is under construction. Ore carrying the mineral cuprodescloizite and reported as assaying 4% V_2O_5, is being developed at Camp Signal, near Goffs. There is a growing demand for vanadium, for use in the steel industry.

ZINC.

Bibliography: Bulletins 38, 67.

Zinc was produced in Shasta, Inyo and San Bernardino counties during 1915, to the amount of 13,043,411 pounds, valued at $1,617,383. This is an unprecedented increase both in tonnage and value over any previous year, and is due mainly to the stimulation of the market, chargeable to the European war. The average price for the year was 14.2¢ per pound, as compared to 5.1¢ during 1914.

The zinc ores of Shasta County are associated with copper, while those of Inyo and San Bernardino are associated with lead-silver ores. The ores are shipped to eastern smelters for treatment.

The production, by counties, was as follows:

County	Pounds	Value
Inyo	4,625,162	$573,520
San Bernardino	39,848	4,941
Shasta	8,378,401	1,038,922
Totals	13,043,411	$1,617,383

Total figures for zinc output of the state are as follows:

Year	Pounds	Value	Year	Pounds	Value
1906	206,000	$12,566	1912	4,331,391	$298,866
1907	177,759	10,598	1913	1,157,947	64,845
1908	54,000	3,514	1914	399,641	20,381
1909			1915	13,043,411	1,617,383
1910					
1911	2,679,842	152,751	Totals	22,049,991	$2,180,931

CHAPTER FOUR.

STRUCTURAL MATERIALS.

As indicated by this chapter heading, the mineral substances herein considered are those more or less directly used in building and structural work. California is independent, so far as these are concerned, and almost any reasonable construction can be made with materials produced in the state. This branch of the mineral industry for 1915 was valued at $13,481,947, as compared with a total value of $14,469,982 for the year 1914. Only a few years ago its value was of no significance in considering the total mineral production of the state. With the growth, in population and otherwise, of California, this subdivision of the mineral industry in the state will increase indefinitely. Deposits of granite, marble and other building stones are distributed widely throughout the state, and slowly but surely transportation and other facilities are being extended so that the growing demand may be met. The largest single item, cement, has an unparalleled record of growth since the inception of the industry in California twenty-four years ago. Not until 1904 did the annual value of cement produced reach the million-dollar mark, following which it increased 500 per cent in nine years; though the last two years it has declined slightly.

Crushed rock production is yearly becoming more worthy of consideration, due to the strides recently taken in concrete building, as well as to activity in the building of good roads. Brick, with an annual output worth nearly $2,000,000, is slowly decreasing, due to the popularity of cement and concrete; nevertheless, this item will be an important one for many years to come, and of course, a market for fire and fancy brick of all kinds will never be lacking.

The following table gives the comparative figures for the value of structural materials produced in California during the years 1914 and 1915. Fifty-one counties contributed to this total, and there is not a county in the state which is not capable of some output of at least one of the following classes of material:

Substance	Value, 1914	Value, 1915	Increase, value	Decrease, value
Bituminous rock	$166,618	$61,468		$105,150
Brick	2,288,227	1,678,756		609,471
Cement	6,558,148	6,044,950		513,198
Chrome	9,434	38,044	$28,610	
Lime	378,663	286,304		92,359
Magnesite	114,380	283,461	169,081	
Marble	48,832	41,518		7,314
Sandstone	45,322	8,438		36,884
Slate		5,000	5,000	
Stone, miscellaneous	4,860,358	5,011,108	150,750	
Totals	$14,469,982	$13,459,047		
Net decrease				$1,010,935

ASPHALT.

Bibliography: State Mineralogist Reports VII, X, XII, XIII. Bulletins 16 and 32.

Asphalt has been usually accounted for in reports by the State Mining Bureau, because in the early days of the oil industry, considerable asphalt was produced from outcroppings of oil sand, and was a separate industry from the production of oil itself. However, at the present time most of the asphalt comes from the oil refineries, which produce a better and more even grade; hence its value is not now included in the mineral total, as to do so would be a partial duplication of the crude petroleum figures. Such natural asphalt as is at present mined is in the form of bituminous sandstones, and is recorded under that designation.

The production of refinery asphalt during 1915 was 166,941 tons, valued at $1,363,207; as compared with 162,624 tons, worth $1,467,550 for 1914.

BITUMINOUS ROCK.

Bibliography: State Mineralogist Reports XII, XIII.

Bituminous rock is used in a number of places, principally for road dressing; but the manufacture of asphalt at the oil refineries has almost eliminated the industry of mining bituminous rock. The production during 1915 from two properties in Santa Cruz and one in San Luis Obispo County was 17,789 tons, valued at $61,468.

The following tabulation shows the total amount and value of bituminous rock quarried and sold in California, from the records compiled by the State Mining Bureau, annually since 1887:

Year	Tons	Value	Year	Tons	Value
1887	36,000	$160,000	1903	21,944	$53,106
1888	50,000	257,000	1904	45,280	175,680
1889	40,000	170,000	1905	24,753	60,436
1890	40,000	170,000	1906	16,077	45,204
1891	39,962	154,164	1907	24,122	72,835
1892	24,000	72,000	1908	30,718	109,818
1893	32,000	192,036	1909	34,123	116,436
1894	31,214	115,193	1910	87,547	165,711
1895	38,921	121,586	1911	75,125	117,279
1896	49,456	122,500	1912	44,073	87,467
1897	45,470	128,173	1913	37,541	78,479
1898	46,836	137,575	1914	66,119	166,618
1899	40,321	116,097	1915	17,789	61,468
1900	25,306	71,495			
1901	24,052	66,354			
1902	33,490	43,411	Totals	1,122,239	$3,408,121

BRICK AND TILE.

Bibliography: Bulletin 38.

As would be expected in a state with diversified and widespread mineral resources, a great variety of brick is annually produced in California, including common, fire, pressed, glazed, sand-lime, and others. As far as possible the different kinds have been segregated in the following tabulation, but in many cases operators report their total without any classification and such figures are of necessity listed as miscellaneous. It will therefore be understood that in no case does the total of a subdivision represent the true amount if figures are also given in the miscellaneous column. Though some sand-lime brick has been made in California for a number of years past, there was none reported for 1915. We have also included under this heading in the present report, the various forms of hollow building "tile" or blocks, instead of under industrial pottery clays as in previous reports.

According to Bulletin No. 38, issued by the California State Mining Bureau, the following analyses show the average and the maximum and minimum of the ingredients commonly occurring in brick clays. A clay in which the percentage of any one or more of the ingredients mentioned is much above the maximum given or below the minimum will prove an inferior, if not worthless, clay for even common brick.

Chemical Analyses of Common Brick Clays.

	Average, per cent	Minimum, per cent	Maximum, per cent
Silica (SiO_2), combined	15.0	12.0	30.0
Silica sand	55.0	20.0	60.0
Alumina (Al_2O_3)	14.0	11.0	25.0
Water (H_2O), combined	4.0	3.0	9.0
Water moisture	2.0	0.0	6.0
Iron oxide (Fe_2O_3)	4.0	2.5	8.0
Lime (CaO)	1.5	0.5	7.0
Magnesia (MgO)	1.5	0.3	7.0
Alkalies (K_2O, Na_2O)	3.5	2.0	7.0

The detailed figures of brick production for 1915, by counties, are as follows:

Brick Production for 1915, by Counties.

County	Common		Pressed, fire, glazed, vitrified		Miscellaneous brick and building tile		Totals	
	Amount, M	Value	Amount, M	Value	Amount, M	Value	Amount, M	Value
Alameda	10,200	$43,350	1,441	$43,415	3,200	$46,000	14,841	$132,765
Amador	----------	----------	4,000	80,000	--------	----------	4,000	80,000
Contra Costa	11,919	79,890	2,943	56,276	53	3,696	14,915	139,862
Fresno	4,750	33,250	--------	----------	--------	----------	4,750	33,250
Humboldt	385	3,330	--------	----------	78	2,235	463	5,565
Imperial	2,946	17,676	--------	----------	12	240	2,958	17,916
Los Angeles	71,643	333,771	13,317	310,948	3,709	175,593	88,669	820,312
Madera	200	1,400	--------	----------	--------	----------	200	1,400
Marin	10,000	50,000	--------	----------	--------	----------	10,000	50,000
Orange	400	2,600	--------	----------	880	13,400	1,280	16,000
Placer	----------	----------	2,000	40,000	--------	----------	2,000	40,000
Riverside	----------	----------	1,055	16,880	--------	----------	1,055	16,880
Sacramento	8,995	44,973	200	4,750	725	33,250	9,920	82,973
San Benito	260	1,560	--------	----------	--------	----------	260	1,560
San Bernardino	400	2,400	--------	----------	--------	----------	400	2,400
San Diego	340	2,500	--------	----------	920	18,525	1,260	21,025
San Joaquin	----------	----------	3,000	75,000	--------	----------	3,000	75,000
San Mateo	----------	----------	715	19,550	--------	----------	715	19,550
Santa Barbara	1,800	14,400	--------	----------	--------	----------	1,800	14,400
Santa Clara	10,096	57,784	--------	----------	--------	----------	10,096	57,784
Shasta	1,836	11,550	--------	----------	--------	----------	1,836	11,550
Tehama	400	2,700	--------	----------	--------	----------	400	2,700
Tulare	5,520	33,364	--------	----------	--------	----------	5,520	33,364
Ventura	150	750	--------	----------	50	1,750	200	2,500
Totals	142,240	$737,248	28,671	$646,819	9,627	$294,689	180,538	$1,678,756

Record of brick production in the state has been kept since 1893 by this Bureau. The annual and total figures since that date, for amount and value, are given in the following table:

Year	Thousands	Value	Year	Thousands	Value
1893	103,900	$801,750	1906	277,762	$2,538,848
1894	81,675	457,125	1907	362,167	3,438,951
1895	131,772	672,360	1908	332,872	2,506,495
1896	24,000	524,740	1909	333,846	3,059,929
1897	97,468	563,240	1910	340,883	2,934,731
1898	100,102	571,362	1911	327,474	2,638,121
1899	125,950	754,730	1912	337,233	2,940,290
1900	137,191	905,210	1913	358,754	2,915,350
1901	130,766	860,488	1914	270,791	2,288,227
1902	169,851	1,306,215	1915	180,538	1,678,756
1903	214,403	1,999,546			
1904	281,750	1,994,740			
1905	286,618	2,273,786	Totals	5,007,769	$40,624,990

CEMENT.

Bibliography: State Mineralogist Reports VIII, IX, XII. Bulletin 38.

Cement is one of the most important structural materials in the output of the state. During 1915 there was produced a total of 4,918,275 barrels, valued at $6,044,950. This output comes from eight operating plants in seven counties, employing approximately 2,600 men. The enlargement of this industry, of course, depends upon the growth of surrounding communities, and a summary of the lime and clay deposits of the state shows that considerable enlargement would not be impossible.

The cement industry is so centralized that it is impossible to apportion the production to the counties in which plants are located without making private business public. With the exception of San Bernardino, no county has more than one cement plant. The two operating plants in San Bernardino County, in 1915, made a total of 915,000 barrels, valued at $980,000; the balance coming from a single plant in each of the following counties: Contra Costa, Kern, Napa, Riverside, Santa Cruz and Solano. A third cement plant is at present under construction in San Bernardino County, at Victorville.

"Portland" cement was first commercially produced in the state in 1891; though in 1860 and for several years following, a natural hydraulic cement from Benicia was utilized in building operations in San Francisco. While the total figures are not of the same magnitude as those for gold and petroleum, the growth of the industry has been more than rapid, and a comparison of the annual figures representing the output since the inception of the industry is of interest.

Annual production of cement in California has been as follows:

Year	Barrels	Value	Year	Barrels	Value
1891	5,000	$15,000	1905	1,265,553	$1,791,916
1892	5,000	15,000	1906	1,286,000	1,941,250
1893			1907	1,613,563	2.585.577
1894	8,000	21,600	1908	1,629,615	2,359,692
1895	16,383	32,556	1909	3,779,205	4,969,437
1896	9,500	28,250	1910	5,453,193	7,485,715
1897	18,000	66,000	1911	6,371,369	9,085,625
1898	50,000	150,000	1912	6,198,634	6,074,661
1899	60,000	180,000	1913	6,167,806	7,743,024
1900	52,000	121,000	1914	5,109,218	6.558,148
1901	71,800	159,842	1915	4,918,275	6,044,950
1902	171,000	423,600			
1903	640,868	968,727			
1904	969,538	1,539,807	Totals	45,869,520	$60,361,377

CHROME.

Bibliography: State Mineralogist Reports IV, XII. Bulletin 38.

Chromic iron ore, to the amount of 3,725 short tons, valued at $38,044, was mined and shipped during 1915. While the material is known to exist in many places in the state, and has been mined in several of the counties, the present production comes largely from Fresno, Shasta and Tuolumne counties.

The European war caused some rise in the price of this material, as most of the chrome used in the United States is imported from Rhodesia and New Caledonia. Considerable effort, therefore, has been expended by private parties in investigating California deposits, more particularly with the idea of expecting to find large quantities which would justify entering the market and making long-time contracts, in competition with the foreign deposits. Some of these investigations have been without success, as the California deposits are, in many cases, not beyond the prospective stage; and lack of transportation facilities has been an important factor. However, new deposits are being found and opened up, and the outlook for the coming year is for a greatly increased yield. The 1915 output was the greatest in tonnage yet recorded, but has been exceeded in value.

The major consumption of chromic iron ore is for its use as a refractory lining in smelting furnaces for steel and copper. A smaller portion is used in the preparation of ferro-chrome for chrome-steel alloys. Some ferro-chrome is now being made in California by the electric furnace.

The distribution of the 1915 product, by counties, was as follows:

County	Tons	Value
Fresno	1,300	$13,600
Shasta	1,757	17,570
Tuolumne	352	2,352
Alameda, Butte, San Luis Obispo, Santa Clara, Siskiyou, Tehama, Tulare*	316	4,522
Totals	3,725	$38,044

*Combined to conceal output of a single producer in each.

A larger amount than the above figures was shown in our Press Bulletin No. 35, issued April 28, 1916. Later information indicates that in one or two localities a considerable tonnage of chromite was actually mined in 1915, and included in the reports of production to this Bureau, though the major portion of it was not shipped from the property until after January 1, 1916. For this reason we have here included for 1915 only such material as was actually disposed of during that year.

The annual output of chromite since 1887 has been as follows:

Year	Tons	Value	Year	Tons	Value
1887	3,000	$40,000	1903	150	$2,250
1888	1,500	20,000	1904	123	1,845
1889	2,000	30,000	1905	40	600
1890	3,599	53,985	1906	317	2,859
1891	1,372	20,580	1907	302	6,040
1892	1,500	22,500	1908	350	6,195
1893	3,319	49,785	1909	436	5,309
1894	3,680	39,980	1910	749	9,707
1895	1,740	16,795	1911	935	14,197
1896	786	7,775	1912	1,270	11,260
1897	----------	----------	1913	1,180	12,700
1898	----------	----------	1914	1,517	9,434
1899	----------	----------	1915	3,725	38,044
1900	140	1,400			
1901	130	1,950			
1902	315	4,725	Totals	34,175	$430,015

LIME.

Bibliography: Bulletin 38.

Lime to the amount of 356,534 barrels, valued at $286,304, was produced from eight counties during 1915, as compared with 439,961 barrels, valued at $378,663, from ten counties in 1914. This figure includes only such lime as is used in building operations. That utilized in sugar making and as a fertilizer are classified under "in-

dustrial materials." That consumed in cement manufacture is included in the value of cement.

Distribution, by counties, is shown in the following table:

County	Barrels	Value
Amador	1,000	$1,200
El Dorado	15,911	12,872
Kern	55,176	39,523
Santa Cruz	191,643	177,873
Siskiyou	745	745
San Bernardino, Shasta and Tuolumne*	92,059	54,091
Totals	356,534	$286,304

*Combined to conceal output of a single plant in each.

For table of production by years, see under "industrial" limestone.

MAGNESITE.

Bibliography: State Mineralogist Reports XII, XIII. Bulletin 38. Reports on Napa, Sonoma, Fresno, 1915. U. S. G. S. Bulletins, 355, 540.

Magnesite has for a number of years been known to exist in many localities in California. In quality it is very high grade, many deposits yielding material carrying about 95% magnesium carbonate. The deposits are mostly in the metamorphic rocks of the Coast Range and Sierra Nevada Mountains, and are scattered over an area nearly four hundred miles long. One deposit of sedimentary origin is situated in the Mojave Desert region. California is the only state, so far of record, in the United States, having magnesite in commercial quantities.

During the year 1915, there was considerable activity in the production of magnesite, giving an output nearly double that of the highest previous year (*i. e.*, 1910). The curtailing of European imports due to the war, the lowering of transcontinental railroad rates on magnesite, manganese and chrome, and the added possibilities for transportation through the Panama Canal, to eastern markets, have led to the increased production. The permanent nature of improvements at some deposits gives promise that future production will be still greater.

The photographs (pp. 48 and 49) illustrate the two types of furnaces used in calcining magnesite in California.

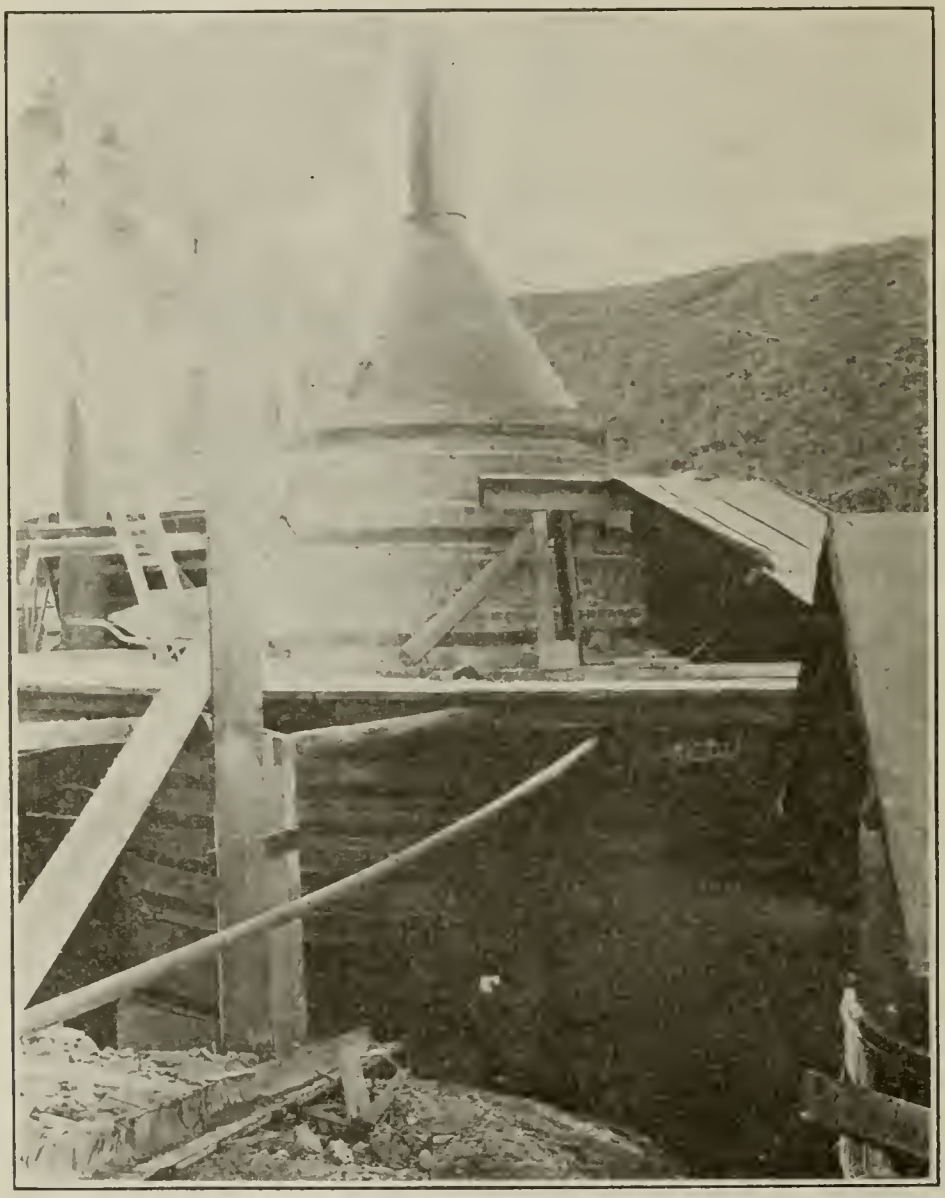
Producing Districts.

The following notes are here recorded concerning the principal producing districts of the state in 1915:

The Tulare Mining Company, Tulare County, as for some years past, was the largest single producer. The magnesite is stoped in underground workings, and calcined in two vertical, shaft kilns. A railroad spur runs direct to the furnaces. The Porterville Magnesite Company

is stoping and quarrying, shipping the product crude. Some output was made from leases operated by the California Magnesite Company. The Lindsay Mining Company has since built a railroad spur and for 1916 will show considerable shipments of crude.

In Santa Clara County, at the Red Mountain deposit, the material is stoped underground, calcined in two vertical kilns, and transported 33 miles by auto trucks to the railroad at Livermore. The adjoining property of the Pacific Magnesite Company is being equipped. In the Sherlock mine, Madrone, the rock is quarried, and shipped crude.



Shaft furnace of Western Magnesite Development Co., at Red Mountain, Santa Clara County, California.

The Sonoma Magnesite Company, Sonoma County, is operating a rotary kiln, and has completed a short railroad for delivery to the main line. Shipments of both raw and calcined ore are made. In 1915, motor trucks were utilized. The Refractory Magnesite Company at

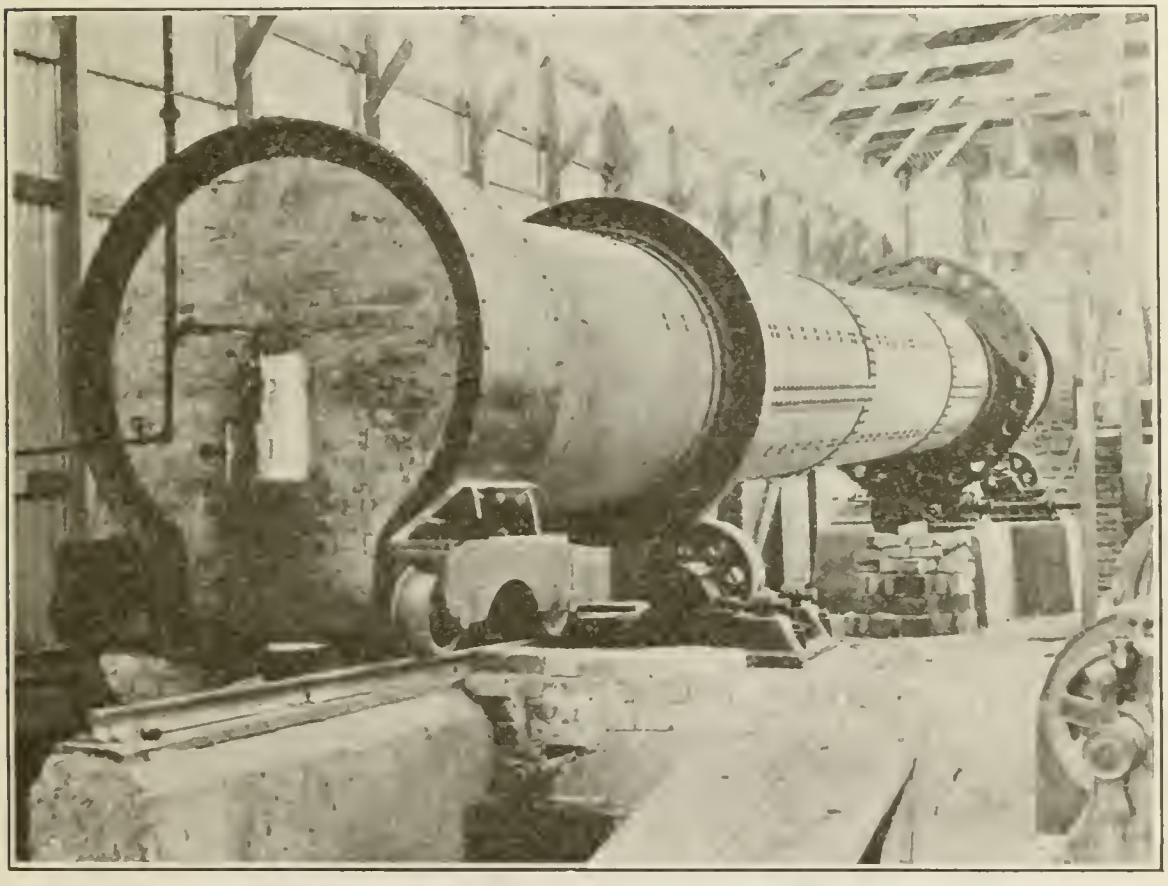
Preston has a magnesite which burns brown, carrying up to 6% Fe_2O_3 and resembles the Austrian "spæder," particularly desired by the steel men.

A considerable tonnage was shipped from the sedimentary deposit at Bissell, in Kern County, and calcined in two rotary kilns at Los Angeles before shipment east.

In Napa County some ore was shipped, crude, from the White Rock mine in Pope Valley, and from a property of the Tulare Mining Company.

There is a calcining plant in operation at San Diego burning magnesite from Lower California, Mexico. To date it has not treated any California magnesite.

A number of owners have carried on development work, and it seems assured that a much greater demand can easily be met by the various California deposits.



Rotary kiln of Sonoma Magnesite Co., at Magnesite, Sonoma County, California.

Uses.

The principal uses at the present time include: refractory linings for basic open-hearth steel furnaces, copper reverberatories and converters, bullion and other metallurgical furnaces; in the manufacture

of paper from wood pulp; and in structural work, for flooring, wainscoting, tiling, sanitary kitchen and hospital finishing, etc. In connection with building work it has proven particularly efficient as a flooring for steel railroad coaches, on account of having greater elasticity and resilience than "Portland" cement. For refractory purposes, the magnesite is "dead-burned"—*i. e.*, all or practically all of the CO_2 is expelled from it. For cement purposes, it is left "caustic"—*i. e.*, from 5 % to 10% of CO_2 is retained. When dry caustic magnesite is mixed with a solution of magnesium chloride ($MgCl_2$) in proper proportions, a very strong cement is produced, known as oxychloride or Sorel cement.[8] "It is applied in a plastic form, * * * which sets in a few hours as a tough, seamless surface. It has also a very strong bonding power, and will hold firmly to wood, metal, or concrete as a base. It may be finished with a very smooth, even surface, which will take a good wax or oil polish. As ordinarily mixed there is added a certain proportion of wood flour, cork, asbestos, or other filler, thereby adding to the elastic properties of the finished product." Its surface is described as "warm" and "quiet" as a result of the elastic and nonconducting character of the composite material. The cement is usually colored by the addition of some mineral pigment to the materials before mixing as cement.

The desirable qualities of any flooring material (cost not considered) are listed for purposes of analysis or comparison under eighteen heads, as follows: Cleanliness (sanitary qualities), quietness, immunity from abrasion (surface wear), resilience, immunity from slipperiness, appearance, waterproof character, plasticity, warmth (thermal insulation), life (immunity from deterioration with age), acid-proof character, alkali-proof character, fire resistance, elasticity, crushing strength, structural strength (rupture), immunity from expansion and contraction, and lightness. The importance of these several qualities varies with the varying requirements to be met; for instance, in some places, as in hospitals, cleanliness is one of the prime considerations; in other places immunity from abrasion might be one of the principal requisites. As to most of these qualities the conclusion is reached that the magnesia cement affords one of the most satisfactory flooring materials for many purposes such as in kitchen, laundry, toilet, and bathrooms, corridors, large rooms or halls in public or other buildings, including hospitals, factories, shops and restaurants.

There is no doubt that the material is steadily coming into more general recognition and favor for these uses. For a few special uses it is more or less disqualified; as an instance, it is not suited for con-

[8]In this summary of the uses and properties of magnesia cement we have drawn freely from the following references:
Eng. Soc. Western Pennsylvania Proc., 1913, vol. 29, pp. 305–338, 418–444;
U. S. G. S., Mineral Resources, 1913, Part II, pp. 450–453.

struction of swimming tanks or for conditions of permanent wetness, since under constant immersion it gradually softens, although it is said to withstand intermittent wetting and drying and is recommended for shower baths. Naturally it is not acid-proof and not wholly alkali-proof, which might be a disadvantage in use for laboratory floors and tables; but these are rather special requirements. Its cost per square foot is given as 25 to 33 cents, depending on area, which is estimated to be lower than marble, cork, rubber, clay or mosaic tile, slate, or terrazzo, although more expensive than wood, asphalt, linoleum, or Portland cement.

In the discussion of the subject the causes of failure are ascribed to uncertain climatic changes, lack of uniformity in the mixtures used, lack of care on the part of those handling the materials, possible deterioration of materials used through exposure (either before or after mixing), lack of proper preparation of foundations on which the material is to be laid, and, as a very important factor, experience or nonexperience in the manipulation or actual laying and troweling of the material. Data concerning the percentages of magnesium chloride and of ground calcined magnesia and data concerning the character and quantity of filler and color added to the commercial preparations are naturally guarded as trade secrets by the firms already in the business. The examination and standardization of the raw materials used, and of acceptable filler materials, and the establishment of standard proportions for the mixtures would seem to be about the only satisfactory way of attacking the problem.

The condition of the calcination of magnesite for cement uses is important, as the same material may undoubtedly be very greatly varied in its reacting properties by differing treatment in the kiln. It is generally agreed that the magnesite for cement use must be comparatively free from lime, as lime has a greater tendency to reabsorb water and carbon dioxide than the magnesia, thereby causing swelling, and is therefore not so permanent in the completed cement as a pure magnesia material. The fillers used may constitute 10% to 40% of the whole cement, and commonly consist of ground marble, sand, sawdust, cork, asbestos, or other materials. As an example of the formulas used in mixing such cements the following are quoted:[9]

Mixtures for the underlying or coarser layer.

[Parts by weight.]

1. 15 parts magnesia.
   10 parts magnesium chloride solution, 20° Baumé.
   10 parts moist sawdust.
   (Sets in 36 hours.)

[9]Scherer, Robert—Der Magnesit, sein Vorkommen, seine Gewinnung und technische Verwertung, pp. 216–217, A. Hartleben's Bibliothek, Wien und Leipzig, 1908.

2. 10 parts magnesia.
   10 parts magnesium chloride solution, 28° Baumé.
   5 parts sawdust.
   (Sets in 16 hours.)
3. 20 parts magnesia.
   15 parts magnesium chloride solution, 20° Baumé.
   4 parts ground cork.
   (Sets in 24 hours.)
4. 5 parts magnesia.
   3 parts magnesium chloride solution, 20° Baumé.
   5 parts ashes.
   (Sets in 24 hours.)

Mixtures for overlying or surface layers.

[Parts by weight.]

1. 40 parts magnesia.
   33 parts magnesium chloride solution, 19° Baumé.
   10 parts asbestos powder.
   5 parts wood flour.
   1 part red ocher.
   (Sets in 24 hours.)
2. 25 parts magnesia.
   25 parts magnesium chloride, 21° Baumé.
   4½ parts wood flour, impregnated with 4½ parts Terpentinharzlösung.
   15 parts yellow ocher.
   (Sets in 30 hours.)

The magnesite used is, as explained, the fine ground calcined (not dead-burned) of certain specified kinds or place of derivation regularly sold for the plastic purposes. This material commonly comes in paper-lined casks, barrels, or boxes, in which form it is fairly permanent, but it deteriorates by exposure, absorbing carbonic acid and moisture from the air. If carefully handled it can probably be kept unopened a year or more, but it should be used within a few weeks after being opened, even under most favorable conditions.

Output and Value.

In considering mineral production the value of the crude material is used as far as practicable. Magnesite presents a peculiar example of a material which previous to the present activity was seldom handled on the market in the crude state. It is ordinarily calcined and ground before being considered marketable. The value of the calcined magnesite varies, the San Francisco price for 1915 ranging from $25 to $45 per ton, which figure includes about $4 per ton freight. From 2 to 2½ tons of the crude material are mined to make one ton of the calcined. In previous reports the foregoing circumstances were used in calculating an arbitrary value for the crude material at the mine, there having

been very little product shipped crude. On a similar basis, the value of the 1915 crude would have been approximately $16 per ton. On the contrary, however, considerable tonnages were in 1915 shipped in the crude state, contracted for at prices ranging from $7 to $11 per ton, f. o. b. rail points, or an average of about $9 per ton.

Magnesite products have been found to be highly satisfactory and are growing in popularity, and the future for this industry appears to be bright. A large supply is already known to exist in California, and only a sufficient demand and cheaper transportation are lacking to make this an item of greater consequence in the mineral total of the state.

Production of crude magnesite for 1915, by county, is given in the following table, with total crude value. Approximately 11,000 tons were shipped in the calcined form, representing about two-thirds of the total:

County	Tons	Value
Fresno and Kern*	6,850	$60,450
Napa	1,050	9,450
Santa Clara	7,623	74,607
Sonoma	3,624	34,788
Tulare	11,574	104,166
Totals	30,721	$283,461

*Combined to conceal output of a single producer in each.

Annual production for California, amount and value, since 1887, is shown in the following tabulation:

Year	Tons	Value	Year	Tons	Value
1887	600	$9,000	1903	1,361	$20,515
1888	600	9,000	1904	2,850	9,298
1889	600	9,000	1905	3,933	16,221
1890	600	9,000	1906	4,032	40,320
1891	1,500	15,000	1907	6,405	57,720
1892	1,500	15,000	1908	10,582	80,822
1893	1,093	10,930	1909	7,942	62,588
1894	1,440	10,240	1910	16,570	113,887
1895	2,200	17,000	1911	8,858	67,430
1896	1,500	11,000	1912	10,512	105,120
1897	1,143	13,671	1913	9,632	77,056
1898	1,263	19,075	1914	11,438	114,380
1899	1,280	18,480	1915	30,721	283,461
1900	2,252	19,333			
1901	4,726	43,057			
1902	2,830	20,655	Totals	149,963	$1,298,259

MARBLE.

Bibliography: State Mineralogist Report XII. Bulletin 38.

Marble is widely distributed in California; and in a considerable variety of colors and grain. During 1915, the production amounted to 22,186 cubic feet, valued at $41,518, from Inyo, San Bernardino, Siskiyou and Tuolumne counties. Included in the output of Siskiyou County is a small amount of rhodonite which was used for decorative purposes.

The decrease in output of marble the past two years is doubtless a reflection of the laxity in building operations, which is shown by some of the other structural materials, also. It is also probably due in part to the fact that foreign, eastern and Alaskan marbles are landed here by water cheaper than much of our local stone can be put on the market, on account of our higher labor costs and transportation difficulties.

Data on annual production since 1887, as compiled by the State Mining Bureau, follows. Previous to 1894 no records of amount were preserved:

Year	Cubic feet	Value	Year	Cubic feet	Value
1887	----------	$5,000	1903	84,624	$97,354
1888	----------	5,000	1904	55,401	94,208
1889	----------	87,030	1905	73,303	129,450
1890	----------	80,000	1906	31,400	75,800
1891	----------	100,000	1907	37,512	118,066
1892	----------	115,000	1908	18,653	47,665
1893	----------	40,000	1909	79,600	238,400
1894	38,441	98,326	1910	18,960	50,200
1895	14,864	56,566	1911	20,201	54,103
1896	7,889	32,415	1912	27,820	74,120
1897	4,102	7,280	1913	41,654	113,282
1898	8,050	23,594	1914	25,436	48,832
1899	9,682	10,550	1915	22,186	41,518
1900	4,103	5,891			
1901	2,945	4,630			
1902	19,305	37,616	Total value	----------	$1,891,896

ONYX AND TRAVERTINE.

Bibliography: State Mineralogist Report XII. Bulletin 38.

Onyx and travertine are known to exist in a number of places in California, but there has been no production reported since the year 1896.

Production by years is as follows:

Year	Value	Year	Value
1887	$900	1893	$27,000
1888	900	1894	20,000
1889	900	1895	12,000
1890	1,500	1896	24,000
1891	2,400		
1892	1,800	Total	$91,400

SANDSTONE.

Bibliography: State Mineralogist Report XII. Bulletin 38. Report on Colusa, etc., counties, 1915.

An unlimited amount of high grade sandstone is available in California, but the wide use of concrete in buildings of every character, as well as the popularity of a lighter colored building stone, has retarded this branch of the mineral industry very seriously during recent years. In 1915 five counties—Napa, San Mateo, Santa Barbara, Siskiyou, and Ventura—turned out 63,350 cubic feet, valued at $8,438, which is a considerable drop from the previous year. The main feature of the loss is the closing of the well known Colusa quarries, on account of the competition of lighter colored materials.

Amount and value, as far as contained in the records of this Bureau, are presented herewith, with total value from 1887 to date:

Year	Cubic feet	Value	Year	Cubic feet	Value
1887		$175,000	1903	353,002	$585,309
1888		150,000	1904	363,487	567,181
1889		175,598	1905	302,813	483,268
1890		100,000	1906	182,076	164,068
1891		100,000	1907	159,573	148,148
1892		50,000	1908	93,301	55,151
1893		26,314	1909	79,240	37,032
1894		113,592	1910	165,971	80,443
1895		35,373	1911	255,313	127,314
1896		28,379	1912	66,487	22,574
1897		24,086	1913	62,227	27,870
1898		46,384	1914	111,691	45,322
1899	56,264	103,384	1915	63,350	8,438
1900	378,468	254,140			
1901	266,741	192,132			
1902	212,123	142,506	Total value		$4,069,006

SERPENTINE.

Bibliography: Bulletin 38.

Serpentine has not been produced in California at any time, to a very large extent, owing to defects in the stone, most of which is not of good texture.

The following table shows the amount and value of serpentine since 1895 as recorded by this Bureau:

Year	Cubic feet	Value	Year	Cubic feet	Value
1895	4,000	$4,000	1903	99	$800
1896	1,500	6,000	1904	200	2,310
1897	2,500	2,500	1905		
1898	750	3,000	1906	847	1,694
1899	500	2,000	1907	1,000	3,000
1900	350	2,000			
1901	89	890			
1902	512	5,065	Totals	12,347	$33,259

SLATE.

Bibliography: Bulletin 38.

Slate was first produced in California in 1889. Up to and including 1910 such production was continuous, there being none between that year and 1915, when there was an output of 1,000 squares reported, valued at $5,000. Many large deposits are known in the state, especially in El Dorado, Calaveras and Mariposa counties, but the demand has been light owing principally to competition of cheaper roofing materials.

The property of the Eureka Slate Company in El Dorado has recently been taken over by the Sierra Slate Corporation of New York, and, it is stated, will be operated on a large scale. This will be the only quarry producing roofing slate, commercially, west of Pennsylvania. This Eureka roofing slate has been passed upon as one of three brands acceptable on Federal work, the other two being from Maine and Pennsylvania, respectively.

The new company expects to prepare for market from 1,000 to 3,000 squares per month. A "square" of roofing slate is a sufficient number of pieces of any size to cover 100 square feet of roof, with allowance generally for a three-inch lap. The size of the pieces of slate making up a square ranges from 7 x 9 inches to 16 x 24 inches, and the number of pieces in a "square" ranges from 85 to 686; and it is worth $3.50 to $10 per square, f. o. b. quarry, depending on quality. The Ferry Building, San Francisco, is roofed with Eureka slate.

A complete record of amount and value of slate produced in California follows:

Year	Squares	Value	Year	Squares	Value
1889	4,500	$18,089	1904	6,000	$50,000
1890	4,000	24,000	1905	4,000	40,000
1891	4,000	24,000	1906	10,000	100,000
1892	3,500	21,000	1907	7,000	60,000
1893	3,000	21,000	1908	6,000	60,000
1894	1,800	11,700	1909	6,961	45,660
1895	1,350	9,450	1910	1,000	8,000
1896	500	2,500	1911	----------	----------
1897	400	2,800	1912	----------	----------
1898	400	2,800	1913	----------	----------
1899	810	5,900	1914	----------	----------
1900	3,500	26,250	1915	1,000	5,000
1901	5,100	38,250			
1902	4,000	30,000			
1903	10,000	70,000	Totals	88,821	$676,399

MISCELLANEOUS STONE.

Bibliography: State Mineralogist Report XII. Bulletin 38.

Miscellaneous stone is the name used throughout this report as the title for that branch of the mineral industry covering crushed rock of all kinds, granite, paving blocks, sand and gravel, and pebbles for grinding mills. The foregoing are very closely related from the standpoint of the producer. The quarry which produces granite blocks this year may have a commercial output of crushed rock next, or its product may regularly consist of both classes of material. Thus it has been found to be most satisfactory to group these items as has been done in recent reports of this Bureau. In so far as it has been possible to do so, granite and crushed rock production has been subdivided into the various uses to which the product was put. It will be noted, however, that in both instances a very large percentage of the output has been tabulated under the heading "Unclassified." This is necessary because of the fact that many of the producers have no way of telling to what specific use their rock was put after they have quarried and sold the same.

In addition to amounts produced by commercial firms, both corporations and individuals, there is hardly a county in the state but uses more or less gravel and broken rock on its roads. Of much of this, particularly in the country districts, there is no definite record kept. Estimates have been made for some of this output, based on the mileage of roads repaired.

For the year 1915, stone shows an increase over the preceding year, but not sufficient to restore it to the level of the 1913 output. Apparently construction work is recovering from the slump in 1914, but has not fully regained its stride. The total value for 1915 was $5,011,108 as compared with $4,860,358 for 1914, and $6,168,020 for 1913.

As has been the case for several years past, Los Angeles County led all others by a wide margin, with an output valued at $1,022,134; followed by Alameda, second, with $457,381; Contra Costa, third, $397,330; and Humboldt fourth, $335,292. Sacramento, Riverside, Fresno and Sonoma were also important producers, in the order named.

The bulletin of the Association of American Portland Cement Manufacturers, November, 1915, relative to building permits during the first 11 months of 1915, indicated the following: Seven cities in California, Nevada, Utah, and Arizona showed a decrease of 34.8% in valuation from same period of 1914, November, 1915, however, showing an increase. A total of 85 cities in the entire United States

showed a net decrease up to August, followed by increases, so that there was a net increase of 2.1% for 11 months over 1914.

In California, the general construction situation in 1915 appeared about normal so far as small jobs were concerned; but there were no large pieces of work done except highway contracts.

Granite.

The output of granite, particularly for building and ornamental purposes, was very materially curtailed by a strike of the granite cutters which started in June and lasted practically throughout the balance of the year.

Granite Production, by Counties, for 1915.

County	Building stone		Monumental		Curbing		Unclassified		Total value
	Cubic feet	Value	Cubic feet	Value	Linear feet	Value	Cubic feet	Value	
Fresno	----------	----------	2,965	$16,263	----------	----------	----------	----------	$16,263
Humboldt	----------	----------	100	100	----------	----------	----------	----------	100
Madera	122,689	$65,822	19,093	13,364	7,781	$5,446	----------	----------	84,632
Napa	----------	----------	----------	----------	[1]4,686	1,172	[2]40,000	$3,500	4,672
Placer	31,113	23,215	10,587	15,111	57,887	41,854	6,916	5,256	85,466
Plumas	900	350	800	1,500	----------	----------	----------	----------	1,850
Riverside	11,968	4,596	4,365	3,303	7,000	3,600	250	400	11,899
Sacramento	----------	----------	----------	----------	----------	----------	1,244	249	249
San Bernardino	21,630	4,998	----------	----------	5,000	500	[3]3,900	1,350	6,848
San Diego	1,600	2,000	5,300	6,300	----------	----------	----------	----------	8,300
San Luis Obispo	----------	----------	----------	----------	----------	----------	[4]1,200	1,200	1,200
Tulare	1,305	979	456	570	3,063	4,900	----------	----------	6,449
Totals	191,205	$101,990	43,666	$56,511	85,417	$57,472	53,510	$11,955	$227,928

[1]Basalt.
[2]Tuff; rough ashlar for walls.
[3]Includes a stone used as a cement kiln liner.
[4]Includes some andesite.

Paving Blocks.

The paving block industry has decreased materially of recent years, because of the increased construction of smoother pavements demanded by motor vehicle traffic. The blocks made in Solano County are of basalt; those from Sonoma of basalt, andesite and some trachyte; while those from all the other counties shown in the tabulation, are of granite.

Paving Block Production, by Counties, for 1915.

County	Amount, M	Value
Madera	866	$34,633
Placer	274	7,340
Riverside	540	26,100
Sacramento	10	500
San Bernardino	100	5,500
San Diego	75	37,500
Sonoma	1,420	59,519
Totals	3,285	$171,092

Grinding Mill Pebbles.

For the first time we are able to record a production of pebbles for tube and other grinding mills. Owing to the decreased imports and higher prices of Belgium and other European flint pebbles, there has been a serious inquiry for domestic sources of supply.

One shipment was made of pebbles selected from gold dredger tailings in Sacramento County, for use in a gold mill in Amador County employing Hardinge mills. It is stated that the consumption was about 3 to 1 as compared to Danish pebbles; and that the long wagon haul, coupled with the heavy consumption, made the cost not economic. Had the pebbles been selected by men with some knowledge of rocks,

Grinding mill pebbles, on beach at Bird Rock, near San Diego, California.

instead of by inexperienced laborers as in this case, a better grade would have been obtained, which no doubt would have proven of better service.

The important development in this item, however, has been in San Diego County. At several points along the ocean shore from Encinitas south to near San Diego, there are beaches of washed pebbles varying from 1 inch to 6 inches in diameter. At one of these localities visited by the writer in May, 1916, there is a conglomerate stratum forming a part of the sea-cliff. This conglomerate is made up of well-rounded water-worn pebbles of various granitic and porphyritic rocks with some felsite and flint. The wave action has broken down portions of the

cliffs for considerable distances and formed beaches of the pebbles, which are well washed and cleaned of the softer materials. The rocks sorted out for shipment are mainly basalt and diabase, with an occasional felsite and flint pebble. There is a tough, black basalt which is stated to be giving satisfactory results. Shipments are being made to metallurgical plants in California, Nevada and Montana.

Grinding Mill Pebbles Production, for 1915.

County	Tons	Value
Sacramento and San Diego	340	$2,810

Sand and Gravel Production, by Counties, for 1915.

County	Tons	Value	County	Tons	Value
Alameda	*$99,979	$265,271	San Benito	2,926	$1,100
Amador	1,000	300	San Bernardino	11,053	5,140
Butte	172,545	20,367	San Diego	*120,692	70,993
Calaveras	1,200	400	San Francisco	500	750
Colusa	15,000	1,000	San Joaquin	43,240	21,620
Contra Costa	159,289	86,360	San Luis Obispo	46,436	11,635
Del Norte	1,000	500	San Mateo	27,661	7,928
El Dorado	32,000	7,000	Santa Barbara	7,800	5,400
Fresno	194,299	78,869	Santa Clara	148,805	50,556
Glenn	526,035	46,526	Shasta	2,036	918
Humboldt	5,000	3,025	Siskiyou	62,769	4,380
Imperial	10,570	2,642	Solano	1,000	400
Kern	63,070	5,393	Sonoma	77,934	25,745
Lake	13,500	5,000	Stanislaus	8,610	2,250
Los Angeles	1,160,636	321,801	Tehama	2,000	750
Madera	10,615	1,242	Trinity	500	700
Marin	5,850	1,463	Tulare	10,000	3,000
Mendocino	2,000	1,000	Tuolumne	1,000	400
Monterey	92,961	28,949	Yolo	3,000	1,200
Napa	148,926	70,016	Yuba	815,698	149,292
Orange	55,348	9,027			
Riverside	9,604	8,621			
Sacramento	207,802	40,321	Totals	5,160,659	$1,369,250

*Includes molding sand.

Crushed Rock Production, by Counties, for 1915.

County	Macadam		Rubble and riprap		Concrete		Unclassified		Totals	
	Tons	Value	Tons	Value	Tons	Value	Tons	Value	Tons	Value
Alameda	165,174	$101,506			64,430	$36,570	107,213	$54,034	336,817	$192,110
Amador	3,000	1,000							3,000	1,000
Butte	5,961	4,371			79,635	42,405			85,596	46,776
Calaveras	3,500	1,500							3,500	1,500
Contra Costa	14,097	2,115	3,000	$1,500	270,989	172,570	235,137	134,785	523,223	310,970
Del Norte	2,000	3,000							2,000	3,000
El Dorado	500	500							500	500
Fresno	60,000	33,000			13,500	7,425	113,170	58,148	186,670	98,573
Humboldt	20,900	28,517	194,700	301,000	2,100	2,650			217,700	332,167
Imperial			93,633	37,453					93,633	37,453
Kern					53,926	53,926			53,926	53,926
Lassen	500	465			360	405			860	870
Los Angeles	359,650	200,833	6,525	2,910	283,767	128,263	764,391	368,327	1,414,336	700,333
Madera			7,060	1,765					7,060	1,765
Marin	40,181	10,000	119,034	56,887	38,071	26,228	13,900	6,959	211,186	100,065
Mariposa	2,000	700					38,285	16,514	40,285	17,214
Mendocino	500	500							500	500
Modoc	500	300							500	300
Monterey	5,500	3,850							5,500	3,850
Napa	34,310	33,424					366	275	34,676	33,699
Nevada	1,000	500							1,000	500
Placer			14,289	4,683			2,050	698	16,339	5,381
Plumas							25,181	3,581	25,181	3,581
Riverside	*112,142	64,465	56,528	22,611	300	318	103,939	79,396	272,909	166,820
Sacramento	78,091	49,472	12,450	1,868	381,451	187,188	9,864	4,379	481,856	242,907
San Benito	286,000	128,700			56,000	25,200			342,000	153,900
San Bernardino	79,700	16,425	316,395	131,093	19,764	13,522			415,859	161,040
San Diego			3,351	2,386	41,889	41,884			45,240	44,270
San Francisco	56,016	51,561	1,000	500	66,808	65,209	10,500	10,250	134,324	127,520
San Luis Obispo	48,742	48,742					38,098	37,898	86,840	86,640
San Mateo	28,656	21,394	2,520	8,440	10,540	2,520	100,357	53,109	142,073	85,463
Santa Barbara	4,522	8,500							4,522	8,500
Santa Clara	82,778	47,697			100	89			82,878	47,786
Santa Cruz	1,595	1,249			3,435	3,779	†2,422	1,766	7,452	6,794
Shasta	1,000	500							1,000	500
Siskiyou	500	250							500	250
Solano	2,000	1,000					58,529	36,176	60,529	37,176
Sonoma	101,567	38,993	161,309	17,163	1,020	1,113	61,214	35,384	325,110	92,653
Trinity	500	200							500	200
Tulare	14,000	9,100	26	17	22,127	14,385	6,000	3,900	42,153	27,402
Tuolumne	4,000	1,500							4,000	1,500
Ventura			5,105	2,674					5,105	2,674
Totals	1,621,082	$915,829	996,925	$392,950	1,410,212	$825,679	1,690,619	$905,570	5,718,838	$3,240,028

†Includes chicken grit. *Includes limestone utilized as asphalt filler.

Total value of production of "Miscellaneous Stone," by counties, for 1915, compared with 1914, showing increase or decrease in each instance:

County	1914	1915	Increase	Decrease
Alameda	$381,135	$457,381	$76,246	
Amador		1,300	1,300	
Butte	50,895	67,143	16,248	
Calaveras		1,900	1,900	
Colusa		1,000	1,000	
Contra Costa	308,727	397,330	88,603	
Del Norte	3,250	3,500	250	
El Dorado	2,600	7,500	4,900	
Fresno	237,963	193,705		$44,258
Glenn	30,553	46,526	15,973	
Humboldt	208,204	335,292	127,088	
Imperial		40,095	40,095	
Kern		59,319	59,319	
Lake		5,000	5,000	
Lassen	775	870	95	
Los Angeles	953,434	1,022,134	68,700	
Madera	192,764	122,272		70,492
Marin	490,137	101,528		388,609
Mariposa	15,366	17,214	1,848	
Mendocino	560	1,500	940	
Modoc		300	300	
Monterey	39,202	32,799		6,403
Napa	130,316	108,387		21,929
Nevada	2,108	500		1,608
Orange	88,315	9,027		79,288
Placer	203,593	98,187		105,406
Plumas	1,879	5,431	3,552	
Riverside	206,802	213,440	6,638	
Sacramento	253,235	284,127	30,892	
San Benito	110,630	155,000	44,370	
San Bernardino	131,978	178,528	46,550	
San Diego	210,250	163,723		46,527
San Francisco	119,889	128,270	8,381	
San Joaquin	19,440	21,620	2,180	
San Luis Obispo		99,475	99,475	
San Mateo	34,648	93,391	58,743	
Santa Barbara	15,300	13,900		1,400
Santa Clara	39,093	98,342	59,249	
Santa Cruz	4,276	6,794	2,518	
Shasta	125	1,418	1,293	
Siskiyou	5,371	4,630		741
Solano	71,288	37,576		33,712
Sonoma	276,516	177,917		98,599
Stanislaus	3,096	2,250		846
Tehama		750	750	
Trinity		900	900	
Tulare	1,750	36,851	35,101	
Tuolumne		1,900	1,900	
Ventura		2,674	2,674	
Yolo		1,200	1,200	
Yuba	14,895	149,292	134,397	
Totals	$4,860,358	$5,011,108		
Net increase			$150,750	

CHAPTER FIVE.

INDUSTRIAL MATERIALS.

The following mineral substances have been arbitrarily arranged under the general heading of "Industrial Materials," as distinguished from those which have a clearly defined classification, such as metals, salines, structural materials, etc.

These materials, many of which are mineral earths, are produced on a comparatively small scale at the present time. Almost without exception the possibilities of development along these lines are practically unlimited; and with increasing transportation, and other facilities, together with a steadily growing demand, the future for this branch of the mineral industry in California is certainly promising. There is scarcely a county in the state but might contribute to the output.

To date, production has been in the majority of instances dependent upon more or less of a strictly local market, and the following data will show the results of such a condition, not only in the widely varying amounts of a certain material produced from year to year, but in widely varying prices of the same material, often, in different sections of the state. Furthermore, the quality of this general class of material will be found to fluctuate, even in the same deposit, especially as regards price. The war in Europe has affected some of these items, but not to the striking degree that it has the metal markets.

The following summary shows the value of the industrial materials produced in California during the years 1914–1915, with increase or decrease in each instance:

Substance	1914, value	1915, value	Increase, value	Decrease, value
Asbestos	$1,530	$2,860	$1,330	
Barytes	3,000	620		$2,380
Clay—pottery	167,552	133,724		33,828
Dolomite		14,504	14,504	
Feldspar	16,565	9,000		7,565
Fuller's earth	5,928	4,002		1,926
Gems	3,970	3,565		405
Gypsum	78,375	48,953		29,422
Infusorial earth	80,350	62,000		18,350
Limestone	517,713	156,288		361,425
Lithia		1,365	1,365	
Mineral paint	847	1,756	909	
Mineral water	476,169	467,738		8,431
Pumice	1,000	6,400	5,400	
Pyrite	230,058	293,148	63,090	
Silica—sand and quartz	22,688	34,322	11,634	
Soapstone and talc	4,500	14,750	10,250	
Totals	$1,610,245	$1,254,995		
Net decrease				$355,250

ASBESTOS.

Bibliography: State Mineralogist Reports XII, XIII. Bulletin 38.

Though asbestos of various grades is known to exist widely distributed in California, the production for the year 1915 was 143 tons, valued at $2,860, the combined result of several small shipments from a number of localities, including Placer, Calaveras, Alameda, and Contra Costa counties. One firm has established a grinding and fiberizing plant in Oakland, and is now manufacturing a series of products in which both asbestos and magnesite play a part. These include steam pipe covering, composition flooring, and plaster for stucco work. The outlook is for a decided increase in the output of these materials during the coming year.

The real history of the development and use of asbestos dates back only about sixty years. Since that time the investigation as to its occurrence, uses, and methods of treatment has been continuous, and its application to everyday life has grown with wonderful rapidity. The first mill built to handle the crude ore and extract the fibre on a large scale by machinery was constructed in 1888.

The first production of asbestos in California was in 1887, when 30 tons were mined, having a crude value of $60 per ton, according to the State Mining Bureau reports.

The bulk of the world's supply of this mineral today comes from Canada; and Canadian asbestos, so far, leads in quality as well as in quantity.

Classification and Characteristics.

The word "asbestos" (derived from the Greek meaning incombustible) as used here includes several minerals, from a strictly mineralogical standpoint. There are two main divisions, however; amphibole and chrysotile. The fibrous varieties of several of the amphiboles (silicates chiefly of lime, magnesia and iron), notably tremolite and actinolite, are called asbestos. Their fibres usually lie parallel to the fissures containing them. Amphibole asbestos possesses high refractory properties, but lacks strength of fibre, and is applicable principally for covering steam pipes and boilers. Chrysotile, a hydrous silicate of magnesia, is a fibrous form of serpentine, and often of silky fineness. Its fibres are formed at right angles to the direction of the fissures containing them. Chrysotile fibres, though short, have considerable strength and elasticity, and may be spun into threads and woven into cloth.

To bring the highest market price asbestos must needs have a combination of properties, *i. e.*, length and fineness of fibre, tensile strength and flexibility—all combined with infusibility. Of these qualities the

most important are toughness and infusibility, and determination of the same can only be made by practical tests or in the laboratory. Given several specimens of the same tensile strength and degree of infusibility, the one having the longest fibre will, of course, be of the greatest value. It must be kept in mind, however, that length of fibre alone, the characteristic which most naturally appeals to the eye, is not the final test in regard to the commercial value of the find; and much short fibre asbestos, which on first appearance is of inferior grade, is being sold and profitably handled at the present time.

The largest Canadian asbestos deposits are worked as open quarries where the ore is roughly sorted before being sent to the mill to be dressed for the market. This method has been found to be cheaper and more satisfactory in every way.

The milling of asbestos ore, while more or less complicated in actual practice, is easy to understand and has one well-defined object in view: That is, the complete eradication of all foreign rock ingredients and the thorough cleaning and separation of the fibres.

Asbestos, roughly speaking, is worth from $20 to $200 per ton. The poorer grades which are unsuitable for weaving, and which, of course, command the lower prices, are used in the manufacture of steam packing, furnace linings, asbestos brick, wall plasters, paints, tilings, asbestos board, shingles, insulating material, etc. The better grades are utilized in the manufacture of tapestries of various kinds, fireproof theater curtains, cloth, rope, etc.

A very important development of the asbestos industry is the rapidly increasing demand for the lower grade material, on account of the numerous diversified uses to which asbestos products are being put, in almost every branch of manufacture. This fact means that many deposits of asbestos will become commercially important even though the grade of the material is far from the best.

It has been discovered only recently that not only does an asbestos wall plaster render the wall so covered impervious to heat, but that in rooms which have given forth an undesirable echo this evil has been absolutely removed. Asbestos pulp mixed with cement and magnesite has been experimented with in the East; and roofing, flooring, and other building material of the most satisfactory sort has been manufactured therefrom.

Value and Production.

The value of the domestic production of asbestos has averaged around $43,000 annually, the past ten years, except 1911, which was approximately $120,000. The imports, largely from Canada, for 1915 amounted to $1,407,758, according to U. S. G. S. Mineral Resources, 1915. This value is for crude material; adding the imported manufactured asbestos articles the figure amounts to $1,776,102.

With the field for development along these lines which is open in California, it seems almost certain that some time in the future will see this branch of the mineral industry adding its share to the total of the wealth and productiveness of this state.

Total amount and value of asbestos production in California since 1887, as given in the records of this Bureau, are as follows:

Year	Tons	Value	Year	Tons	Value
1887	30	$1,800	1903		
1888	30	1,800	1904	10	$162
1889	30	1,800	1905	112	2,625
1890	71	4,260	1906	70	3,500
1891	66	3,960	1907	70	3,500
1892	30	1,830	1908	70	6,100
1893	50	2,500	1909	65	6,500
1894	50	2,250	1910	200	20,000
1895	25	1,000	1911	125	500
1896			1912	90	2,700
1897			1913	47	1,175
1898	10	200	1914	51	1,530
1899	30	750	1915	143	2,860
1900	50	1,250			
1901	110	4,400			
1902			Totals	1,635	$78,952

BARYTES.

Bibliography: State Mineralogist Report XII. Bulletin 38.

The output of crude barytes during 1915 was 410 tons, valued at $620, from Mariposa and Los Angeles counties, as compared with the 1914 production of 2,000 tons, worth $3,000. This indicates a spot value of only $1.50 per ton, approximately, for the 1915 product. As a matter of fact barytes is ordinarily sorted and ground before being put on the market, and in this prepared condition brings from $10 to $15 per ton. The principal use of this material is in the paint industry. Minor uses are in tanning of leather, manufacture of paper and rope, and sugar refining. A grinding and chemical plant is in operation at Melrose, Alameda County, making a specialty of barium compounds; and another at South San Francisco.

Known occurrences of this mineral in California are located in Butte, Mariposa, San Benito, San Bernardino, Shasta, Calaveras, Inyo and Nevada counties. The deposit at El Portal, in Mariposa County, has given the largest commercial production to date. The tonnage above recorded is in part, witherite (barium carbonate, $BaCO_3$) from El Portal. This is the first commercial production of the carbonate in the United States, of which we are able to find any record (as we pointed out in our Press Bulletin 35, April 28, 1916). The El Portal witherite and barite are both high grade. The current year, 1916, will show a

considerable output from a new deposit being opened up on Fremont's Peak in San Benito County.

The first recorded production of barytes in California, according to the statistical reports of the State Mining Bureau, was in 1910. The annual figures are as follows:

Year	Tons	Value	Year	Tons	Value
1910	860	$5,640	1914	2,000	3,000
1911	309	2,207	1915	410	620
1912	564	2,812			
1913	1,600	3,680	Totals	5,743	$17,959

CLAY—POTTERY.

Bibliography: State Mineralogist Reports I, IV, IX, XII. Bulletin 38.

At one time or another in the history of the state, pottery clay has been quarried in thirty-three of its counties. In this report "pottery clay" refers to all clays used in the manufacture of red and brown earthenware, flower pots, ornamental tiling, architectural terra cotta, sewer pipe, etc., and the figures for amount and value are relative to the crude material at the pit, without reference to whether the clay was sold in the crude form, or whether it was immediately used in the manufacture of any of the above finished products by the producer. It does not include clay used in making brick and building blocks.

During 1915 producers in seven counties reported an output of 157,866 tons of clay, having a spot value of $133,141 for the crude material, as compared with the 1914 production of 179,948 tons worth $167,552.

A tabulation of the direct returns from the producers, by counties, for the year 1915, is shown herewith:

County	Tons	Value	Used in manufacture of—
Amador	†40,156	$38,879	Fire-clay products; sewer pipe, architectural terra cotta, porcelain, stoneware, pottery.
Los Angeles	6,507	1,511	Terra cotta, sewer pipe.
Placer	49,126	37,536	Terra cotta, roofing et al. tile, sewer and chimney pipe, architectural terra cotta.
Riverside	59,564	54,840	Sewer pipe, pottery, terra cotta, etc.
Alameda, Kern, Sonoma*	†2,513	958	Chimney and vitrified sewer pipe, stoneware, porcelain.
Totals	157,866	$133,724	

†Includes kaolin. *Combined to conceal output of a single operator in each.

Amount and value of clay-pottery output in California since 1887, are given in the following table:

Year	Tons	Value	Year	Tons	Value
1887	75,000	$37,500	1903	90,972	$99,907
1888	75,000	37,500	1904	84,149	81,952
1889	75,000	37,500	1905	133,805	130,146
1890	100,000	50,000	1906	167,267	162,283
1891	100,000	50,000	1907	160,385	254,454
1892	100,000	50,000	1908	208,042	325,147
1893	24,856	67,284	1909	299,424	465,647
1894	28,475	35,073	1910	249,028	324,099
1895	37,660	39,685	1911	224,576	252,759
1896	41,907	62,900	1912	199,605	215,683
1897	24,592	30,290	1913	231,179	261,273
1898	28,947	33,747	1914	179,948	167,552
1899	40,600	42,700	1915	157,866	133,724
1900	59,636	60,956			
1901	55,679	39,144			
1902	67,933	74,163	Totals	3,321,531	$3,623,068

DOLOMITE.

Bibliography: Bulletin 67.

In the present report, dolomite is for the first time made the subject of a separate classification. Previously it has been included under limestone. Limestones are frequently more or less magnesian-bearing, and a chemical analysis is often necessary to definitely decide as to whether they are calcite or dolomite; the latter standing intermediate between magnesite ($MgCO_3$) and calcite ($CaCO_3$). As dolomite, as such, has been found to have certain distinctive applications, we have deemed it worthy of a separate classification.

The major portion of the tonnage shipped in 1915 was utilized as a refractory lining in open-hearth steel furnaces, as a partial substitute for magnesite. A portion was used for its carbonic acid gas (CO_2), and part for its magnesia. A greatly increased output is anticipated for the year 1916, as we are informed that one company with quarries in San Benito and Monterey counties has contracted to furnish calcined dolomite to one of the large paper mills. As this dolomite has been found to contain the proper proportions of lime and magnesia, it will replace an artificial mixture of calcined limestone and magnesite in the manufacture of paper from wood pulp.

The production of dolomite for the year 1915 amounted to 4,192 tons, valued at $14,504, and came from a total of five quarries in the following counties: Inyo, San Benito, San Bernardino and Tuolumne.

FELDSPAR.

Bibliography: Bulletin 67.

Feldspar was produced by one operator in Monterey and three in Tulare County during 1915, to the amount of 1,800 tons, valued at $9,000. Feldspar production only dates back to 1910 in this state. The mineral is a constituent of many rocks, but can only be commercially produced from pegmatites where the crystals are large and quite free from impurities. The open cut method of mining this material is commonly used. Manufacturers of enamel wares and pottery buy most of the better grades of feldspar produced. Small quantities are used in the manufacture of glass and scouring soaps, and the more impure material is utilized as "chicken grit," in making various brands of roofing, and in other ways. Various experiments have been made with the potash feldspars in the attempt to prove their value as a fertilizer, with more or less negative results, so far.

Total amount and value of feldspar production in California since the inception of the industry are given in the following table, by years:

Year	Tons	Value	Year	Tons	Value
1910	760	$5,720	1914	3,530	$16,565
1911	740	4,560	1915	1,800	9,000
1912	1,382	6,180			
1913	2,129	7,850	Totals	10,341	$49,875

FULLER'S EARTH.

Bibliography: Bulletin 38.

Fuller's earth production in California during the year 1915 amounted to 692 tons, valued at $4,002, as compared with 760 tons, valued at $5,928, in 1914.

This material is soft and friable, and, in general, resembles a clay. It has no definite mineralogical composition, and its commercial value is determined by its physical properties, *i. e.*, texture, and filtering and absorbent properties.

In California, fuller's earth is used in clarifying both refined mineral and vegetable oils, although its original use was in fulling wool, as the name indicates. During 1915 the production came from Calaveras, Kern, Kings and Solano counties. A large deposit of high grade fuller's earth is found near Elsinore in Riverside County.

It was first produced commercially in this state in 1899, and the total amount and value of the output since that time are as follows:

Year	Tons	Value	Year	Tons	Value
1899	620	$12,400	1909	459	$7,385
1900	500	3,750	1910	340	3,820
1901	1,000	19,500	1911	466	5,294
1902	987	19,246	1912	876	6,500
1903	250	4,750	1913	460	3,700
1904	500	9,500	1914	760	5,928
1905	1,344	38,000	1915	692	4,002
1906	440	10,500			
1907	100	1,000			
1908	50	1,000	Totals	9,844	$156,275

GEMS.

Bibliography: Bulletins 37, 64, 67. State Mineralogist Report II.

Accounting for the production of gems in California is somewhat unsatisfactory, owing to the widely scattered places at which stones are gathered and marketed in a very small way. The following table shows the production by counties during 1915:

County	Value	Kind
Butte	$300	Diamonds.
Los Angeles	700	Beach stones.
San Diego	2,465	Beryl, golden beryl, hyacinth, kunzite, tourmalines, green topaz.
San Mateo	100	Beach stones.
Total	$3,565	

California tourmalines are decidedly distinctive in coloring and "fire" as compared to foreign stones of this classification. The colors range from deep ruby to pink, and various shades of green; also more recently a blue tourmaline has been found.

Two of our California gem stones, kunzite and benitoite, are not found elsewhere in the world; and these, each in but a single locality here: the former in the Pala Chief Mine in San Diego County, and the latter in the Dallas Mine in San Benito County.

Some rhodonite was taken out in Siskiyou County in 1915, and used for decorative purposes, its value being included in the marble figures.

The value of the total gem production in California annually since the beginning of commercial production is as follows:

Year	Value	Year	Value
1900	$20,500	1909	$193,700
1901	40,000	1910	237,475
1902	162,100	1911	51,824
1903	110,500	1912	23,050
1904	136,000	1913	13,740
1905	148,500	1914	3,970
1906	497,090	1915	3,565
1907	232,642		
1908	208,950	Total	$2,083,606

GRAPHITE.

Bibliography: State Mineralogist Report XIII. Bulletin 67.

Graphite has been produced from time to time in the state, coming principally from Sonoma County, and was used in paint manufacture. It is difficult for these deposits, which are not particularly pure, to compete with foreign supplies which go on the market almost directly as they come from the deposit.

The annual graphite production of the United States amounts to about $250,000; the yearly imports have a value of approximately two million dollars. These facts show the possibilities which are open to this branch of the mineral industry provided, of course, that investigation would show sufficient amounts of high grade material to compete with the imported article, which at the present time comes largely from Ceylon. Low grade ores are concentrated with considerable difficulty and the electric process of manufacturing artificial graphite from coal has been perfected to such a degree that only deposits of natural graphite of a superior quality can be exploited with any certainty of success.

On account of its unfusibility and resistance to the action of molten metals, graphite is very valuable. It is also largely used in the manufacture of electrical appliances, of "lead" pencils, as a lubricant and in many other ways. Amorphous or "lump" graphite, commonly carrying many impurities, is worth as low as $10 a ton. For some purposes, such as foundry facings, etc., the low grade material is very satisfactory. The price increases with the grade of the material until the best quality crystalline variety, ranges as high as $200 per ton.

Occurrence of graphite has been reported at various times from Calaveras, Fresno, Imperial, Los Angeles, Mendocino, San Bernardino,

San Diego, Siskiyou, Sonoma and Tuolumne counties. There is some prospect of a production for the current year from a property now being opened up in Los Angeles County.

During 1915 no production was reported in this state. The previous production, by years, was as follows:

Year	Pounds	Value
1901	128,000	$4,480
1902	84,000	1,680
1913	2,500	25
Totals	214,500	$6,185

GYPSUM.

Bibliography: Bulletins 38, 67.

Gypsum is widely distributed throughout the state, and is produced to a considerable extent, to supply the fertilizer manufacturers and the manufacturers of plaster and cement. One producer reports large orders for shipment during the current year to Honolulu, for fertilizer purposes.

During 1915, seven producers in Kern, Riverside and San Bernardino counties took out a total of 20,200 tons, valued at $48,953. The principal decrease from 1914 was due to the closing of the San Benito County quarries (formerly credited to Monterey).

Total annual production of gypsum in California since such records have been compiled by this Bureau is as follows:

Year	Tons	Value	Year	Tons	Value
1887	2,700	$27,000	1903	6,914	$46,441
1888	2,500	25,000	1904	8,350	56,592
1889	3,000	30,000	1905	12,850	54,500
1890	3,000	30,000	1906	21,000	69,000
1891	2,000	20,000	1907	8,900	57,700
1892	2,000	20,000	1908	34,600	155,400
1893	1,620	14,280	1909	30,700	138,176
1894	2,446	24 584	1910	45,294	129,152
1895	5,158	51,014	1911	31,457	101,475
1896	1,310	12,580	1912	37,529	117,388
1897	2,200	19,250	1913	47,100	135,050
1898	3,100	23,600	1914	29,734	78,375
1899	3,663	14,950	1915	20,200	48,953
1900	2,522	10,088			
1901	3,875	38,750			
1902	10,200	53,500	Totals	385,922	$1,602,798

INFUSORIAL EARTH.

Bibliography: State Mineralogist Reports II, XII, XIII. Bulletins 38, 67.

Infusorial, or diatomaceous, earth—sometimes called tripolite—is a very light and extremely porous, chalk-like material composed of pure silica (chalk, being calcareous) which has been laid down under water and consists of the remains of microscopical infusoria and diatoms. Its principal commercial use is as an absorbent; and it is also employed in the manufacture of scouring soap and polishing powders, and in making some classes of refractory brick. It is a first-class nonconductor of heat, where high temperatures are employed. In such cases, it is built in as an insulating layer in furnace walls.

The most important deposits in California thus far known are located in Monterey, Orange, San Luis Obispo, and Santa Barbara counties. It is also found in Fresno, Kern, Los Angeles, Plumas, San Benito, San Bernardino, Shasta, Sonoma, and Tehama counties.

During 1915, there were three actively operated quarries, in Monterey, San Joaquin and Santa Barbara counties, which produced a total of 12,400 tons, valued at $62,000, compared with 12,800 tons, valued at $80,350, in 1914.

It will be noted that the average price varies widely from year to year. This fact is true in case of many of the industrial materials. The quality of the product fluctuates as does the demand; when both are favorable the maximum price obtains.

The first recorded production of this material in California occurred in 1889; total amount and value of output, to date, are as follows:

Year	Tons	Value	Year	Tons	Value
1889	39	$1,335	1904	6,950	$112,282
1890			1905	3,000	15,000
1891			1906	2,430	14,400
1892			1907	2,531	28,948
1893	50	2,000	1908	2,950	32,012
1894	51	2,040	1909	500	3,500
1895			1910	1,843	17,617
1896			1911	2,194	19,670
1897	5	200	1912	4,129	17,074
1898			1913	8,645	35,968
1899			1914	12,840	80,350
1900			1915	12,400	62,000
1901					
1902	422	2,532			
1903	2,703	16,015	Totals	63,682	$462,943

LIMESTONE.

Bibliography: State Mineralogist Reports IV, XII. Bulletin 38.

Limestone was produced in 10 counties during 1915, to the amount of 146,324 tons, valued at $156,288. This amount does not include the limestone used in the manufacture of cement nor of lime for building purposes, but accounts for that utilized as a smelter flux, for sugar making, and in other chemical and manufacturing processes (including fertilizers, roofing preparations, whiting for paint, terrazzo and for CO_2). The marked drop in the 1915 output as compared with the 1914 figures, is due in part to our transferring to the macadam classification a large tonnage of limestone employed as road metal; but which in the 1914 report was classified as "industrial" limestone.

Distribution of the 1915 output is as follows:

County	Tons	Value	County	Tons	Value
Alameda	10	$20	Santa Cruz	2,047	$4,873
Contra Costa	11,989	14,565	Shasta	44,953	40,945
Kern	1,425	1,710	Tulare	1,349	1,888
Placer	1.236	2,432	Tuolumne	8,859	11,349
San Bernardino	68,500	68,500			
Santa Barbara	5,956	10,006	Totals	146,324	$156,288

In the early reports of this Bureau values for lime and limestone were not segregated. The following tabulation shows the total combined value of such material since records for the state were first compiled, in 1887, to date:

Year	Value	Year	Value
1887	$368,750	1903	$582,268
1888	381,750	1904	658,956
1889	416,780	1905	878,647
1890	350,000	1906	925,887
1891	300.000	1907	1,162,417
1892	300,000	1908	676,507
1893	301,276	1909	997,745
1894	337,975	1910	1,058,891
1895	457,784	1911	843,778
1896	332,617	1912	1,034,688
1897	291,465	1913	803,002
1898	278,558	1914	896,376
1899	343,760	1915	442,592
1900	315,231		
1901	434,133		
1902	460,140	Total	$16,631,973

LITHIA.

Bibliography: State Mineralogist Reports II, IV. Bulletins 38, 67.

Lithia mica, lepidolite (a silicate of lithium et al.) utilized in the manufacture of artificial mineral water, fireworks, etc., was mined and sold in San Diego County during the years 1899–1905 inclusive, but there has been no commercial production since the latter date, until 1915. Some ambygonite, a lithium phosphate, has also been obtained, from pockets associated with the gem tourmalines. In 1915, the yield of lepidolite was 91 tons, valued at $1,365.

The following table of analyses shows the composition of some of the lithia minerals:

Analyses of Lithia Minerals.[10]

	Amblygonite, Pala, Cal. (per cent)	Lepidolite, Pala, Cal. (per cent)	Spodumene, Goshen, Mass. (per cent)	Spodumene, Branchville Mass. (per cent)	Lepidolite, Paris, Maine (per cent)
Lithia (Li_2O)	8.26	4.91	6.89	7.62	4.20
Silica (SiO_2)	1.99	48.61	63.27	64.25	50.92
Phosphoric acid (P_2O_5)	45.47				
Alumina (Al_2O_3)	33.09	22.36	23.73	27.20	24.99
Iron oxide (FeO)	Trace		1.17	.20	.23
Potash (K_2O)		16.16	1.45		11.38
Soda (Na_2O)		.38	.99	.39	2.11
Loss on ignition, water, etc.	6.28		.36	.24	1.96
Undetermined	3.56				
Lime (CaO)	1.35	.64	.11		
Magnesia (MgO)			2.02		
Fluorine		2.05			6.29

Lithia mica total production in the state has been as follows:

Year	Tons	Value	Year	Tons	Value
1899	124	$4,600	1904	641	$25,000
1900	440	11,000	1905	25	276
1901	1,100	27,500	1915	91	1,365
1902	822	31,880			
1903	700	27,300	Totals	3,943	$128,921

MICA.

Bibliography: State Mineralogist Reports II, IV. Bulletins 38, 67.

No production of mica has recently been reported. Production in previous years has been as follows:

Year	Tons	Value
1902	50	$2,500
1903	50	3,800
1904	50	3,000
Totals	150	$9,300

[10]Bulletin No. 38, p. 308.

MINERAL PAINT.

Bibliography: State Mineralogist Reports XII, XIII. Bulletin 38.

Mineral paint, principally yellow ochre, was produced in California in 1915, from Calaveras, San Bernardino and Stanislaus counties, amounting to 311 tons, valued at $1,756. This is a little more than double the tonnage and value of 1914.

Besides the above named counties, deposits of mineral paint are located in the following: Kern, Kings, Lake, Los Angeles, Nevada, Riverside, and Sonoma.

The first recorded production of this material in the state was in the year 1890. Production, showing annual amount and value, to date since that time is given herewith:

Year	Tons	Value	Year	Tons	Value
1890	40	$480	1904	270	$1,985
1891	22	880	1905	754	4,025
1892	25	750	1906	250	1,720
1893	590	26,795	1907	250	1,720
1894	610	14,140	1908	335	2,250
1895	750	8,425	1909	305	2,325
1896	395	5,540	1910	200	2,040
1897	578	8,165	1911	186	1,184
1898	653	9,698	1912	300	1,800
1899	1,704	20,294	1913	303	1,780
1900	529	3,993	1914	132	847
1901	325	875	1915	311	1,756
1902	589	1,533			
1903	2,370	3,720	Totals	12,776	$128,720

MINERAL WATER.

Bibliography: State Mineralogist Reports VI, XII, XIII. U. S. G. S., Water Supply Paper 338.

A widespread production of mineral water is shown by the following table for 1915. These figures refer to mineral water actually bottled for sale, or for local consumption. Water from some of the springs having a decided medicinal value brings a price many times higher than the average shown, while in some cases the water is used merely for drinking purposes and sells for a nominal figure. Health and pleasure resorts are located at many of the springs. The waters of some of the hot springs are not suitable for drinking, but are very efficacious for bathing. From a therapeutic standpoint, California is particularly rich in mineral springs. The counterparts of practically any of the world-famed spas of Europe or the eastern United States can be found here.

Commercial production, by counties, for 1915 was:

County	Gallons	Value	County	Gallons	Value
Butte	5,000	$850	San Diego	10,350	$1,035
Calaveras	15,343	5,752	San Luis Obispo	4,500	675
Colusa	91,480	15,003	Santa Barbara	189,026	156,175
Humboldt	2,000	500	Santa Clara	38,400	16,770
Lake	165,130	24,371	Shasta	12,000	1,800
Los Angeles	350,171	29,491	Siskiyou	626,680	62,990
Marin	60,000	9,000	Solano	64,200	8,000
Monterey	8,200	2,050	Sonoma	258,600	41,231
Napa	133,387	73,535	Tehama	1,000	500
Riverside	200,000	10,000	Trinity	120	360
San Benito	1,200	300			
San Bernardino	37,480	7,350	Totals	2,274,267	$467,738

Amount and value of mineral water produced in California since 1887 are given herewith:

Year	Gallons	Value	Year	Gallons	Value
1887	618,162	$144,368	1903	2,056,340	$558,201
1888	1,112,202	252,990	1904	2,430,320	496,946
1889	808,625	252,241	1905	2,194,150	538,700
1890	258,722	89,786	1906	1,585,690	478,186
1891	334,553	139,959	1907	2,924,269	544,016
1892	331,875	162,019	1908	2,789,715	560,507
1893	383,179	90,667	1909	2,449,834	465,488
1894	402,275	184,481	1910	2,335,259	522,009
1895	701,397	291,500	1911	2,637,669	590,654
1896	808,843	337,434	1912	2,497,794	529,384
1897	1,508,192	345,863	1913	2,350,792	599,748
1898	1,429,809	213,817	1914	2,443,572	476,169
1899	1,338,537	406,691	1915	2,274,267	467,738
1900	2,456,115	268,607			
1901	1,555,328	559,057			
1902	1,701,142	612,477	Totals	46,718,627	$11,179,703

PHOSPHATES.

Bibliography: Bulletin 67.

No commercial production of phosphates has been recorded from California, though occasional pockets of the lithia phosphate, amblygonite, $Li(AlF)PO_4$, have been found associated with the gem tourmaline deposits in San Diego County. Such production has been classified under lithia.

PUMICE and VOLCANIC ASH.

Bibliography: State Mineralogist Report XII (see "Tufa"). Bulletin 38.

The production of pumice and volcanic ash for the year 1915 amounted to 380 tons, valued at $6,400, and came from Imperial, Inyo

and Madera counties. The material from Imperial County is the vesicular, block pumice, this being practically the only locality in the United States producing this class of rock at the present time; and is stated to have found a ready market. The Lipari Islands, Italy, have in the past been the principal source of supply of block pumice, but now largely shut off owing to the European war. There are other known deposits of such pumice in California, in Inyo, Madera, Mono and Siskiyou counties, but not at present utilized. The material shipped from Inyo and Madera counties in 1915 was the fine-grained, volcanic ash of tuff variety. It is employed in making scouring soaps and polishing powders.

Commercial production of pumice in California was first reported to the State Mining Bureau in 1909, then not again until 1912, since which year there has been a small annual output, as indicated by the following table:

Year	Tons	Value	Year	Tons	Value
1909	50	$500	1914	50	$1,000
1910	----	----	1915	380	6,400
1911	----	----			
1912	100	2,500			
1913	3,590	4,500	Totals	4,170	$14,900

PYRITE.

Bibliography: Bulletin 38.

Pyrite is extensively mined in several places, and used in the manufacture of sulphuric acid. Two properties in Alameda County and one in Shasta report a total production in 1915 of 92,462 tons, valued at $293,148.

This does not include the vast quantities of pyrite which are otherwise treated for their valuable metal contents.

The total production in California to date is as follows:

Year	Tons	Value	Year	Tons	Value
1898	6,000	$30,000	1908	107,081	$610,335
1899	5,400	28,620	1909	457,867	1,389,802
1900	3,642	21,133	1910	42,621	179,862
1901	4,578	18,429	1911	54,225	182,954
1902	17,525	60,306	1912	69,872	203,470
1903	24,311	94,000	1913	79,000	218,537
1904	15,043	62,992	1914	79,267	230,058
1905	15,503	63,958	1915	92,462	293,148
1906	46,689	145,895			
1907	82,270	251,774	Totals	1,203,356	$4,085,273

SILICA—SAND AND QUARTZ.

Bibliography: State Mineralogist Report IX. Bulletins 38, 67.

We have combined these materials in the present report, because of the overlapping roles of vein quartz which is mined for use in glass making and as an abrasive, and that of silica sand which, although mainly utilized in glass manufacture, also serves as an abrasive.

It is expected that a certain tonnage of vein quartz will be employed before the end of the current year in the preparation of ferro-silicon and silico-manganese by the electric furnace.

The production of silica in 1915 amounted to 28,904 tons, valued at $34,322, from four properties in Amador County, and one each in Calaveras, Monterey, Riverside and Tulare counties.

County	Tons	Value
Amador	13,339	$16,142
Calaveras, Monterey, Riverside and Tulare	15,565	18,180
Totals	28,904	$34,322

Of the above total, 740 tons were of vein quartz, and 28,164 tons, sand.

Practically all the glass sand produced in California occurs as such and needs no grinding. There are various deposits of quartz which could be utilized for glass making, but to date there has been but little commercial production of this class of material.

Glass sand has been produced in the following counties of the state: Alameda, Amador, El Dorado, Los Angeles, Monterey, Orange, Placer, Riverside, San Joaquin, and Tulare. The chief producing centers have been Monterey and Los Angeles counties, the outstanding recent feature having been the entrance of Amador to the list, in 1914. The industry is of small importance, so far, because of the fact that the available deposits are largely not of a grade which will produce first-class glass. Many high-grade deposits are known, but almost without exception transportation facilities are so poor that the owners are unable to compete with the foreign sand which is brought in as ballast and sold at a low price.

Total silica production in California since the inception of the industry, in 1899, is shown below, being mainly glass sand:

Year	Tons	Value	Year	Tons	Value
1899	3,000	$3,500	1909	12,259	$25,517
1900	2,200	2,200	1910	19,224	18,265
1901	5,000	16,250	1911	8,620	8,672
1902	4,500	12,225	1912	13,075	15,404
1903	7,725	7,525	1913	18,618	21,899
1904	10,004	12,276	1914	28,538	22,688
1905	9,257	8,121	1915	28,904	34,322
1906	9,750	13,375			
1907	11,065	8,178			
1908	9,255	22,045	Totals	200,994	$252,462

SOAPSTONE OR TALC.

Bibliography: State Mineralogist Report XII. Bulletins 38, 67.

Soapstone—also called talc or steatite—occurs widely distributed throughout California. It is found as a hydration product in the alteration of magnesian silicates, and is often associated with serpentine and actinolite. But few deposits have been proven of especial value to date, although there is an undoubted future for this branch of the mineral industry in the state. Deposits of high grade, white talc, the equal of the imported Italian article, are now being developed in Inyo and San Bernardino counties. It is used in making paper, toilet articles, soap, lubricants, tiling, etc., and for such is ordinarily ground to about 200 mesh before marketing. In this condition it brings $15 per ton and upwards, depending on quality.

There was a total output in 1915 of 1,663 tons, valued at $14,750, from four producers in Inyo County and one each in El Dorado and San Bernardino counties, divided as follows:

County	Tons	Value
Inyo	1,513	$14,000
El Dorado and San Bernardino	150	750
Totals	1,663	$14,750

Production has been intermittent in the state since 1893, as shown in the following table:

Year	Tons	Value	Year	Tons	Value
1893	400	$17,750	1906		
1894			1907		
1895	25	375	1908	3	$48
1896			1909	33	280
1897			1910	740	7,260
1898			1911		
1899			1912	1,750	7,350
1900			1913	1,350	6,150
1901	10	119	1914	1,000	4,500
1902	14	288	1915	1,663	14,750
1903	219	10,124			
1904	228	2,315			
1905	300	3,000	Totals	7,735	$74,309

STRONTIUM.

Bibliography: Bulletin 67.

Deposits of celestite (strontium sulphate, $SrSO_4$) are known in the desert region of San Bernardino County, but as yet undeveloped. A small amount of strontium salts is used in the United States in fireworks manufacture. There is undoubtedly a good future for the strontium minerals in California, if the beet-sugar factories will take up their use, as has been done in Germany. Strontia is much more efficient and satisfactory in that process than lime.

SULPHUR.

Bibliography: State Mineralogist Reports IV, XIII. Bulletins 38, 67.

There is, at present, no commercial output of native sulphur in California although this mineral has been found to some extent in Colusa, Imperial, Inyo, Kern, Lake, Mariposa, San Bernardino, Sonoma, Tehama, and Ventura counties. Production of sulphur is very improbable in the immediate future, although possibilities of such a condition remain to be proven.

Sulphur was produced at the famous Sulphur Bank Mine, in Lake County, during the years 1865–1868 (inc.), totaling 941 tons, valued at $53,500; following which the property became more valuable for its quicksilver. There has been no commercial yield of sulphur in California since that period.

CHAPTER SIX.

SALINES.

Borax, salt, soda, nitrates and potash are included under this heading. Borax and salt have been produced in California since the sixties, although no official records of output were kept by this Bureau previous to 1887. Soda has had a virtually continuous production since 1894. The nitrates have never been commercially produced in the state, and potash but recently, although the future possibilities along these lines are indeed great.

The desert portions of California, located largely in Inyo, Kern, Riverside, Imperial, and San Bernardino counties, are rich in the possession of salines of all descriptions. Ancient lake beds of vast extent are found there, many of which have not yet been exploited.

The following tabulation shows amount and value of the saline minerals produced in California during the years 1914 and 1915, with increase or decrease in value for 1915 as compared with the previous year:

Substance	1914		1915		Increase+ Decrease- (value)
	Tons	Value	Tons	Value	
Borax	62,500	$1,483,500	67,004	$1,663,521	$180,021+
Potash	10	460	1,076	19,391	18,931+
Salt	223,806	583,553	169,028	368,737	214,816—
Soda	6,522	115,396	5,799	83,485	31,911—
Totals		$2,182,909		$2,135,134	
Net decrease					$47,775—

BORAX.

Bibliography: State Mineralogist Reports III, X, XII, XIII. Bulletins 24, 67.

Borax was first discovered in California in the waters of Tuscan Springs in Tehama County, January 8, 1856. Borax Lake, in Lake County, was discovered in September of the same year, by Dr. John A. Veatch. This deposit was worked in 1864-1866 (inc.), and during that time produced 1,181,365 pounds of borax. Not till 1873 were the borax deposits of Inyo and San Bernardino counties discovered.

Aside from the above mentioned localities borax is known in Kern, Los Angeles, Imperial, Solano and Ventura counties.

California is the only state in America producing borax. During 1915 two producers reported an output of 67,004 tons, valued at $1,663,521, compared with three producers and an output of 62,500 tons, valued at $1,483,500, in 1914.

Value of the state's borax output since 1887 is shown in the following table:

Year	Value	Year	Value
1887	$116,689	1903	$661,400
1888	196,636	1904	698,810
1889	145,473	1905	1,019,158
1890	480,152	1906	1,182,410
1891	640,000	1907	1,200,913
1892	838,787	1908	1,117,000
1893	593,292	1909	1,163,960
1894	807,807	1910	1,177,960
1895	595,900	1911	1,456,672
1896	675,400	1912	1,122,713
1897	1,080,000	1913	1,491,530
1898	1,153,000	1914	1,483,500
1899	1,139,882	1915	1,663,521
1900	1,013,251		
1901	982,380		
1902	2,234,994	Total	$28,133,190

MAGNESIA.

Magnesium chloride is an important item in certain chemical uses, and in the preparation of Sorél cement in laying magnesite floors. In the past, Germany has been the principal source of this chloride, which source is at the present time, of course, cut off. For this reason, experiments are being made to prepare it from magnesite, which is so abundant in California; and also by some of the salt companies, from the residual bitterns obtained during the evaporation of sea water for its sodium chloride.

NITRATES.

Nitrates of sodium, potassium and calcium have been found in various places in the desert regions of the state but no deposit of commercial value has been developed as yet. Interest in this class of mineral substance is increasing and closer search may be rewarded by valuable discoveries.

The subject of the fixation of atmospheric nitrogen electrically is just now occupying a place in the public mind by reason of its success in Germany and Scandinavia. The possibilities of cheap hydroelectric power in California make the subject one of intense interest to us, as we have also the natural raw products to go with the power.

POTASH.

Potash had not, previous to 1914, been commercially produced in California and only during the past few years has this substance created general interest in the state. Considerable money has been spent recently in preliminary work with a view toward developing what are claimed to be immense deposits of potash which lie in the old lake beds of the desert portions of California. The imports of this material from foreign countries have an annual value of many millions of dollars, and a domestic production would be of great utility.

During 1915, a total of 1,076 tons of potash-bearing material was produced, valued at $19,391, being in part an extraction from kelp, and in part from dust collected at one of the cement mills. There was one kelp plant in commercial operation at Long Beach, Los Angeles County, and several others in course of construction both there and at San Diego. Some of these plants merely dry the kelp, others burn it to an ash, both types shipping their product to the fertilizer manufacturers. The one plant in operation in 1915 and one of those building at San Diego are designed to prepare refined potash salts.

The large plant of the American Trona Corporation at Searles Lake, in San Bernardino County, is under construction and will produce potash, soda-ash and borax from the lake beds.

Experiments are also being made to extract potash from the bitterns obtained at some of the salt and soda works, particularly those at Owens Lake in Inyo County.

In the cement mill mentioned above, the fine dust from ball and tube mills, is collected by a Cottrell, electrical, smoke condenser, the material showing an approximately 11% potash content. This was sold to fertilizer manufacturers. All of the material thus collected was not sold, however; the unsold portion going back into the cement-making process. In future, its sales will probably increase.

SALT.

Bibliography: State Mineralogist Reports II, XII, XIII. Bulletin 24.

Most of the salt produced in California is obtained by evaporating the waters of the Pacific Ocean, plants being located on the shores of San Francisco Bay, at Long Beach, and on San Diego Bay. Additional amounts are derived from lakes and lake beds in the desert regions of the state. The salt production of San Bernardino County is derived from deposits of rock salt which are worked by means of quarrying with a steam shovel. A small amount of valuable medicinal

salts was produced during the year in Mono and Tehama counties, by evaporation from mineral springs.

The 1915 output amounted to 169,028 tons, valued at $368,737, distributed as follows, by counties:

County	Tons	Value
Alameda	103,768	$220,977
Inyo, Kern, Los Angeles, Mono, Modoc, Solano, Tehama*	21,602	61,070
San Bernardino	512	3,324
San Diego	17,616	19,616
San Mateo	25,500	63,750
Totals	169,028	$368,737

*Combined to conceal output of a single plant in each.

The decrease, as compared with the 1914 figures of 223,806 tons, valued at $583,553, was mainly in the northern counties; and was due to late rainfall in May, 1915, which washed out much of the crop.

Amount and value of annual production of salt in California from 1887 to date is shown in the following tabulation:

Year	Tons	Value	Year	Tons	Value
1887	28,000	$112,000	1903	102,895	$211,365
1888	30,800	92,400	1904	95,968	187,300
1889	21,000	63,000	1905	77,118	141,925
1890	8,729	57,085	1906	101,650	213,228
1891	20,094	90,303	1907	88,063	310,967
1892	23,570	104,788	1908	121,761	281,469
1893	50,500	213,000	1909	155,680	414,708
1894	49,131	140,087	1910	174,920	395,417
1895	53,031	150,576	1911	173,332	324,255
1896	64,743	153,241	1912	185,721	383,370
1897	67,851	157,520	1913	204,407	462,681
1898	93,421	170,855	1914	223,806	583,553
1899	82,654	149,588	1915	169,028	368,737
1900	89,338	204,754			
1901	126,218	366,376			
1902	115,208	205,876	Totals	2,798,640	$6,710,427

SODA.

Bibliography: State Mineralogist Reports XII, XIII. Bulletins 24, 67.

Bicarbonate of soda and soda ash were produced by two plants in Inyo County during 1915, amounting to 5,799 tons, valued at $83,485, as compared with 6,522 tons, valued at $115,396, in 1914.

The total output, showing amount and value of this product since the inception of this branch of the mineral industry in California is given in the table which follows:

Year	Tons	Value	Year	Tons	Value
1894	1,530	$20,000	1906	12,000	$18,000
1895	1,900	47,500	1907		
1896	3,000	65,000	1908	9,600	14,400
1897	5,000	110,000	1909	7,712	11,593
1898	7,000	154,000	1910	8,125	11,862
1899	10,000	250,000	1911	9,023	52,887
1900	1,000	50,000	1912	7,200	37,094
1901	8,000	400,000	1913	1,861	24,936
1902	7,000	50,000	1914	6,522	115,396
1903	18,000	27,000	1915	5,799	83,485
1904	12,000	18,000			
1905	15,000	22,500	Totals	157,272	$1,583,653

CHAPTER SEVEN.

MINERAL PRODUCTION OF CALIFORNIA BY COUNTIES.

Introductory.

The state of California includes an area of 155,652 square miles and is divided into fifty-eight counties. Some mineral of commercial value exists in every county, and during 1915 active production was reported to the State Mining Bureau from fifty-six counties of the fifty-eight. In the mountainous portions of the state are found the vein-forming minerals, largely. In the vast desert regions of southeastern California ancient lake beds afford an unlimited supply of saline deposits. Underlying the interior valleys of the central and southern portion of the state are the largest pools of crude oil in the world. Building stones and mineral earths of all descriptions are widely distributed throughout the length and breadth of the state.

Of the first seven counties in point of total output, all but two (Shasta and Amador) owe their position mainly to petroleum. Kern, due to its oil, leads all the others by more than three times the total of Shasta, its nearest competitor. Shasta owes its rank to copper, gold, and zinc; Amador, its place on account of gold. Nineteen counties have each a total in excess of a million dollars.

The counties with their mineral resources, production for 1915, etc., will be considered in detail in this chapter.

Value of California Mineral Production, by County, for 1915, Arranged In the Order of Their Importance.

County	Value	County	Value
1. Kern	$25,335,184	31. Mariposa	$412,326
2. Shasta	8,350,133	32. Humboldt	358,686
3. Fresno	8,152,300	33. Sonoma	276,104
4. Orange	6,617,112	34. San Joaquin	248,394
5. Los Angeles	4,168,612	35. San Luis Obispo	227,632
6. Amador	4,063,762	36. San Diego	211,129
7. Santa Barbara	3,984,966	37. Stanislaus	191,771
8. Nevada	3,492,946	38. Tulare	184,599
9. Inyo	2,771,042	39. San Mateo	177,891
10. Yuba	2,862,430	40. Marin	160,528
11. San Bernardino	2,674,042	41. Madera	145,063
12. Sacramento	2,562,281	42. San Francisco	128,270
13. Calaveras	2,161,893	43. Mono	109,425
14. Butte	1,622,245	44. Merced	94,032
15. Santa Cruz	1,581,531	45. Monterey	84,986
16. Solano	1,335,923	46. Imperial	77,433
17. Riverside	1,349,591	47. Lake	72,534
18. Contra Costa	1,309,505	48. Glenn	46,667
19. Tuolumne	1,171,438	49. Mendocino	24,536
20. Placer	963,860	50. Kings	18,608
21. Ventura	904,767	51. Colusa	16,003
22. Napa	884,221	52. Modoc	8,681
23. Alameda	861,683	53. Tehama	4,702
24. Plumas	745,715	54. Del Norte	4,524
25. Sierra	729,518	55. Yolo	2,040
26. San Benito	642,065	56. Lassen	870
27. Santa Clara	635,229	57. Alpine	----------
28. Siskiyou	514,094	58. Sutter	----------
29. Trinity	499,511		
30. El Dorado	428,336	Total	$96,663,369

ALAMEDA.

Alameda County, while in no sense one of the "mining counties" of the state, comes twenty-third on the list with a value of mineral products for 1915 of $861,683, a decrease from the 1914 total, which was $870,427. The mineral resources of this county include asbestos, brick, chromite, clay, coal, lime, magnesite, manganese, pyrite, salt, soapstone, and miscellaneous stone.

Commercial production for 1915 was as follows:

Substance	Amount	Value
Brick	14,841 M.	$132,765
Limestone	10 tons	20
Manganese	319 tons	3,652
Pyrite	11,287 tons	45,148
Salt	103,768 tons	220,977
Stone, miscellaneous	----------	457,381
Other minerals*	----------	1,740
Total	----------	$861,683

*Includes asbestos, chrome, and pottery clay.

ALPINE.

Alpine has usually shown a small production of gold and silver, but dropped out of the list of producing counties for 1914 and 1915.

This county lies just south of Lake Tahoe, in the high Sierra Nevada range of mountains. Its area is 776 square miles, containing a population of but 309 persons. Transportation is by wagon or mule back, and facilities in general are lacking to promote development work of any kind.

The mineral resources of this section are varied and the country has not yet been thoroughly prospected. Barium, copper, gold, gypsum, lead, limestone, pyrite, rose quartz, silver, tourmaline, and zinc have been found here to some extent.

AMADOR.

Area: 601 square miles.

Population: 9,086 (1910 census).

The value of Amador County's mineral production increased from $3,211,109 in 1914, to $4,063,762, thus taking sixth place on the list of counties in the state as regards total value of mineral substances marketed. The most notable feature of the increase was the wonderful jump made in the gold yield.

Although having an output consisting of 10 different minerals, the leading product, gold, makes up nearly 98 per cent of the entire total. Amador led the state in gold production, in 1915.

The mineral resources of this county are, in the main, as follows: Asbestos, brick, chromite, clay, coal, copper, gold, lime, quartz crystals, glass-sand, sandstone, silver, soapstone, and miscellaneous stone.

Commercial production for 1915 was as follows:

Substance	Amount	Value
Brick	4,000 M.	$80,000
Clay, pottery	40,156 tons	38,879
Copper	4,185 lbs.	732
Gold		3,894,125
Lead	523 lbs.	25
Lime	1,000 bbls.	1,200
Silica	13,339 tons	16,142
Silver		20,409
Stone, miscellaneous		1,300
Other minerals		10,950
Total		$4,063,762

BUTTE.

Area: 1,722 square miles.

Population: 27,301 (1910 census).

Location: North central portion of state.

Butte, fourteenth county in California in regard to the value of its mineral output, reported a commercial production of nine mineral substances, having a total value of $1,622,245, as compared with $1,755,315 for 1914. As will be noted in the following tabulation, gold is by far the most important item. Butte stands fifth among the gold-producing counties of the state. Among the mineral resources of this section are asbestos, barytes, chromite, gems, gold, limestone, marble, mineral water, platinum minerals, silver, and miscellaneous stone.

Commercial production for 1915 was as follows:

Substance	Amount	Value
Copper	11 lbs.	$2
Gems		300
Gold		1,545,976
Lead	90 lbs.	4
Mineral water	5,000 gals.	850
Platinum	126 ounces	3,997
Silver		3,433
Stone, miscellaneous		67,143
Other minerals		540
Total		$1,622,245

CALAVERAS.

Area: 1,027 square miles.

Population: 9,171.

Location: East central portion of state—Mother Lode district.

Calaveras County reported production of 11 different minerals, valued at $2,161,893, during the year 1915, as compared with the 1914 output, worth $2,068,343. Gold, copper and silver are the chief mineral substances produced. In regard to total value of mineral output Calaveras stands thirteenth among the counties of the state; it is sixth in gold, second in copper, and fourth in silver.

The principal mineral resources developed and undeveloped are: Asbestos, barytes, chromite, clay, copper, fuller's earth, gold, graphite, limestone, magnesite, marble, mineral paint, mineral water, platinum minerals, pyrite, quartz crystals, silver, soapstone, and miscellaneous stone.

Commercial production for 1915 was as follows:

Substance	Amount	Value
Copper	4,031,149 lbs.	$705,451
Gold		1,391,134
Lead	163 lbs.	8
Mineral water	15,343 gals.	5,752
Silver		53,298
Stone, miscellaneous		1,900
Other minerals*		4,350
Total		$2,161,893

*Includes asbestos, fuller's earth, mineral paint, platinum and silica.

COLUSA.

Population: 7,732 (1910 census).

Location: Sacramento Valley.

Colusa County lies largely in the basin of the Sacramento Valley. Its western border, however, rises into the foothills of the Coast Range of mountains, and its mineral resources—to a great extent undeveloped—include coal, chromite, copper, gypsum, manganese, mineral water, pyrite, quicksilver, sandstone, miscellaneous stone, sulphur, and in some places traces of gold and silver.

The value of the 1915 production was $16,003, a decrease from the 1914 figures of $32,251, giving it fifty-first place.

Commercial production for 1915 was as follows:

Substance	Amount	Value
Mineral water	91,480 gals.	$15,003
Stone, miscellaneous		1,000
Total		$16,003

CONTRA COSTA.

Contra Costa, like Alameda County, lies off the eastern shores of San Francisco Bay, and is not commonly considered among the mineral-producing counties of the state. It stands eighteenth on the list in this respect, however, with an output valued at $1,309,505 for the calendar year 1915. Various structural materials make up the chief items, including brick, cement, limestone, and miscellaneous stone. Among the others are asbestos, clay, coal, gypsum, manganese, mineral water and soapstone.

Commercial production for 1915 was as follows:

Substance	Amount	Value
Brick	14,915 M.	$139,862
Limestone	11,989 tons	14,565
Stone, miscellaneous		397,330
Other minerals*		757,748
Total		$1,309,505

*Includes asbestos, cement and coal.

DEL NORTE.

Area: 1,024 square miles.

Population: 2,417 (1910 census).

Location: Extreme northwest corner of state.

Transportation: Wagon and mule back.

Del Norte rivals Alpine County in regard to inaccessibility. Like the latter county also, given transportation and kindred facilities, this portion of the state presents a wide field for development along mining lines especially. Its chief mineral resources, largely untouched, are chromite, copper, gems, gold, graphite, iron, platinum minerals, silver, and miscellaneous stone.

Commercial production for 1915, giving it fifty-fourth place, was as follows:

Substance	Value
Gold	$1,018
Silver	6
Stone, miscellaneous	3,500
Total	$4,524

EL DORADO.

Area: 1,753 square miles.

Population: 7,492 (1910 census).

Location: East central portion of the state; northernmost of the Mother Lode counties.

El Dorado County, which marks the spot where gold was first discovered in California, comes thirtieth on the list of counties ranked according to the value of their total mineral production during the year 1915. In addition to the segregated figures here given, a large tonnage of limestone is annually shipped from El Dorado for use in cement manufacture, and whose value is included in the state total for cement.

The mineral resources of this section, many of them undeveloped, include asbestos, barytes, chromite, clay, copper, gems, gold, iron, molybdenum, limestone, quartz crystals, quicksilver, glass-sand, slate, soapstone, silver and miscellaneous stone.

Commercial production for 1915 was as follows:

Substance	Amount	Value
Copper	417 lbs.	$73
Gold		401,288
Lime	15,911 bbls.	12,872
Silver		1,353
Stone, miscellaneous		7,500
Other minerals*		5,250
Total		$428,336

*Includes slate and soapstone.

FRESNO.

Area: 5,950 square miles.

Population: 75,657 (1910 census).

Location: South central portion of state.

Fresno County, third in importance as a mineral producer among the counties of California, reported an output for 1915 of nine mineral substances, with a total value of $8,152,300, an increase over the reported 1914 production, which was worth $7,484,231. The great bulk of the above value is derived from the petroleum production of the Coalinga field.

The mineral resources of this county are many, and, aside from crude oil, are far from being fully developed. They include asbestos, barytes, brick, chromite, copper, gems, gold, graphite, gypsum, iron, magnesite, natural gas, petroleum, quicksilver, silver, and miscellaneous stone.

Commercial production for 1915 was as follows:

Substance	Amount	Value
Brick	4,750 M.	$33,250
Chrome	1,300 tons	13,600
Copper	65,903 lbs.	11,533
Gold		4,151
Natural gas	2,894,834 M cu. ft.	253,906
Petroleum	14,021,025 bbls.	7,641,459
Silver		246
Stone, miscellaneous		193,705
Other minerals		450
Total		$8,152,300

GLENN.

Glenn County, standing forty-eighth, owes its position among the mineral-producing counties of the state to the presence of large deposits of sand and gravel which are annually worked, the product being used for railroad ballast, etc. In the foothills in the western portion of the county, deposits of chromite, copper, manganese, sandstone, and soapstone have been found.

Commercial production for 1915 was as follows:

Substance	Amount	Value
Copper	746 lbs.	$131
Stone, miscellaneous		46,526
Other minerals		10
Total		$46,667

HUMBOLDT.

Area: 3,634 square miles.

Population: 33,857 (1910 census).

Location: Northwestern portion of state, bordering on Pacific Ocean.

Humboldt County is almost entirely mountainous, transportation within its limits being very largely by wagon road and trail, and until recently was reached from the outside world by steamer only. The county is rich in mineral resources, chief among which are brick, chromite, coal, clay, copper, gold, graphite, iron, mineral water, natural gas, petroleum, platinum, silver, and miscellaneous stone.

Seven mineral substances, as shown by the table given below, having a total value of $358,686, were produced in 1915, as compared with the 1914 output, worth $233,574, the marked increase being due to the large amount of stone being used on the Eureka Harbor breakwater. Humboldt ranks thirty-second among the counties of the state for the year.

Commercial production for 1915 was as follows:

Substance	Amount	Value
Brick	463 M.	$5,565
Gold		15,947
Mineral water	2,000 gals.	500
Silver		62
Stone, miscellaneous		335,292
Other minerals*		1,320
Total		$358,686

*Includes copper and natural gas.

IMPERIAL.

Area: 4,089 square miles.

Population: 30,000 (estimated by board of supervisors).

Location: Extreme southeast corner of the state.

During 1915 Imperial County produced six mineral substances having a total value of $77,433, as compared with the 1914 output, worth $239,140. Its rank is forty-sixth. This county contains large undeveloped deposits of gold, gypsum, lead, marble, pumice, salt, and silver.

Commercial production for 1915 was as follows:

Substance	Amount	Value
Brick	2,958 M.	$17,916
Copper	65 lbs.	11
Gold		14,369
Silver		42
Stone, miscellaneous		40,095
Other minerals		5,000
Total		$77,433

INYO.

Area: 10,019 square miles.

Population: 6,974 (1910 census).

Location: Lies on eastern border of state, north of San Bernardino County.

Inyo, the second largest county in the state, and containing less than one inhabitant per square mile, is extremely interesting from a mineralogical point of view. It is noted because of the fact that within its borders are located both the highest point, Mount Whitney (elevation 14,502 feet), and the lowest point, Death Valley (elevation 290 feet below sea level), in the United States. In the higher mountainous sections are found many vein-forming minerals, and in the lake beds of Death Valley saline deposits exist.

Inyo's mineral production during the year 1915 reached a value of $2,771,042, the county standing ninth among the counties of the state in this respect. Its mineral resources include antimony, asbestos, barytes, bismuth, borax, copper, gems, gold, gypsum, lead, magnesite, marble, molybdenum, mineral water, nitre, platinum, pumice, quicksilver, salt, silver, soda, sulphur, talc, tungsten, and zinc.

Commercial production for 1915 was as follows:

Substance	Amount	Value
Copper	154,722 lbs.	$27,076
Gold		317,905
Lead	4,323,639 lbs.	203,211
Silver		127,894
Soapstone and talc	1,513 tons	14,000
Soda	5,799 tons	83,485
Zinc	4,625,162 lbs.	573,520
Other minerals*		1,423,951
Total		$2,771,042

*Includes antimony, borax, dolomite, marble, pumice, salt.

KERN.

Area: 8,003 square miles.

Population: 55,000 (estimated by board of supervisors).

Location: South central portion of state.

Kern County, because of its immense, productive oil fields, stands pre-eminent among all counties of California in the value of its mineral output, the exact figures for 1915 being $25,335,184. This is larger by more than seventeen million dollars than the succeeding county on the list. This figure also exceeds the value of the total gold output of the entire state by approximately $3,000,000. The 1914 mineral output for the county was worth $28,047,957.

Among the mineral resources, developed and undeveloped, of this section are: Antimony, asbestos, asphalt, barytes, borax, brick, clay, copper, fuller's earth, gems, gold, gypsum, iron, lead, limestone, magnesite, marble, mineral paint, natural gas, petroleum, potash, salt, silver, soapstone, soda, sulphur, and tungsten.

Commercial production for 1915 was as follows:

Substance	Amount	Value
Antimony	267 tons	$11,301
Copper	1,047 lbs.	183
Gold		983,319
Lead	84,371 lbs.	3,965
Lime	55,176 bbls.	39,523
Limestone	1,425 tons	1,710
Natural gas	12,163,461 M cu. ft.	737,638
Petroleum	54,810,669 bbls.	23,184,913
Silver		13,316
Stone		59,319
Other minerals*		299,997
Total		$25,335,184

*Includes cement, clay (pottery), fuller's earth, gypsum, magnesite, salt, tungsten.

KINGS.

Area: 1,159 square miles.

Population: 16,230 (1910 census).

Location: South central portion of state.

Little development has taken place in Kings County along mineral lines to date. Deposits of fuller's earth, gypsum, mineral paint, natural gas, and quicksilver, of undetermined extent, have been found in the county. Some drilling for oil is under way.

In fiftieth place, commercial production for 1915 was as follows:

Substance	Amount	Value
Natural gas	258 M cu. ft.	$608
Other minerals*		18,000
Total		$18,608

*Includes fuller's earth and quicksilver.

LAKE.

Area: 1,278 square miles.

Population: 5,526 (1910 census).

Location: About fifty miles north of San Francisco Bay and the same distance inland from the Pacific Ocean.

On account of its topography and natural beauties, Lake County is sometimes referred to as the Switzerland of America. The mineral resources which exist here are many and varied, actual production being comparatively small, as shown by the table below. Some of the leading minerals found in this section, in part as yet undeveloped, are borax, chromite, clay, copper, gems, gold, gypsum, mineral water, quicksilver, silver, and sulphur.

In forty-seventh place, commercial production for 1915 was as follows:

Substance	Amount	Value
Mineral water	165,130 gals.	$24,371
Quicksilver	492 flasks	41,660
Stone, miscellaneous		5,000
Other minerals*		1,503
Total		$72,534

*Includes copper, gold and silver.

LASSEN.

Area: 4,531 square miles.

Population: 7,000 (estimated by board of supervisors, 1913).

Location: Northeast portion of state.

Lassen County is one of the least explored sections of California. Since about 1912 a railroad traversing the county north and south has been in operation, thus affording opportunity for development along mineral and other lines.

Among the mineral resources of this county are copper, gems, gypsum, gold, silver, and sulphur.

In fifty-sixth place, commercial production for 1915 was as follows:

Substance	Value
Stone, miscellaneous	$870
Total	$870

LOS ANGELES.

Area: 4,067 square miles.

Population: 800,000 (estimated by Chamber of Commerce, 1913).

Mineral production in Los Angeles County for the year 1915 amounted in value to $4,168,612, as compared with the 1914 output, worth $4,665,504. This county ranks fifth in the state as a mineral producer.

Its output of brick was nearly a million dollars, and that of petroleum amounted nearly to two million dollars. Among its mineral resources may be noted asphalt, barytes, borax, brick, clay, fuller's earth, gems, gold, graphite, gypsum, infusorial earth, limestone, marble, mineral paint, mineral water, natural gas, petroleum, salt, glass-sand, sandstone, serpentine, silver, soapstone, and miscellaneous stone. Some potash is obtained from kelp.

Commercial production for 1915 was as follows:

Substance	Amount	Value
Brick	88,669 M.	$820,312
Clay (pottery)	6,507 tons	1,511
Gems		700
Mineral water	350,171 gals.	29,491
Natural gas	1,729,035 M cu. ft.	120,783
Petroleum	2,931,098 bbls.	1,843,661
Stone, miscellaneous		1,022,134
Other minerals*		330,020
Total		$4,168,612

*Includes barite, borax, potash, salt.

MADERA.

Area: 2,112 square miles.

Population: 15,000 (estimated by Chamber of Commerce, 1913).

Location: East central portion of state.

Madera County produced six mineral substances during the year 1915, having a total value of $145,063, as compared with the 1914 output, worth $203,517. This county contains deposits of copper, gold, iron, lead, molybdenum, pumice, silver, and building stone.

In forty-first place, commercial production for 1915 was as follows:

Substance	Amount	Value
Brick	200 M.	$1,400
Copper	40,294 lbs.	7,051
Gold		11,214
Silver		2,126
Stone, miscellaneous		122,272
Other minerals		1,000
Total		$145,063

MARIN.

Area: 529 square miles.

Population: 25,114 (1910 census).

Mineral production in Marin County during the year 1915 reached a value of $160,528, as compared to the 1914 output, worth $554,137. The considerable decrease was due to completion early in the year of three large contracts for rubble and macadam—the Key Route mole, San Francisco waterfront bulkhead and the Exposition roadways—rock for all of which came from Marin County. This county is not especially prolific in minerals, although among its resources along these lines are brick, gems, manganese, mineral water, soapstone, and miscellaneous stone.

In fortieth place, commercial production for 1915 was:

Substance	Amount	Value
Brick	10,000 M.	$50,000
Mineral water	60,000 gals.	9,000
Stone, miscellaneous		101,528
Total		$160,528

MARIPOSA.

Area: 1,463 square miles.

Population: 3,956 (1910 census).

Location: Most southerly of the Mother Lode counties. East central portion of state.

Mariposa County is one of the distinctly "mining" counties of the state, although it stands but thirty-first on the list of counties in regard to the value of its mineral output for 1915, with a total of $412,326, as compared with the 1914 figures of $187,870. The increase is due to gold.

Its mineral resources are varied; among the more important items being barytes, copper, gems, gold, lead, marble, silver, slate, soapstone, and miscellaneous stone.

Commercial production for 1915 was as follows:

Substance	Amount	Value
Copper	38,630 lbs.	$6,760
Gold		385,577
Silver		2,175
Stone, miscellaneous		17,214
Other minerals		600
Total		$412,326

MENDOCINO.

Area: 3,453 square miles.

Population: 23,929 (1910 census).

Location: Joins Humboldt County on the south and bounded by the Pacific Ocean on the west.

Mendocino's annual mineral production is small, the 1915 output being valued at $24,536, ranking it forty-ninth among the counties. That of 1914, however, was worth $560. The increase is due to manganese.

Deposits of undetermined value, of asbestos, chromite, coal, copper, graphite, magnesite, and mineral water have been found, as well as traces of gold and silver. For the coming year there are good prospects for a continued commercial yield of manganese ore.

Commercial production for 1915 was as follows:

Substance	Amount	Value
Manganese ore	2,858 tons	$23,036
Stone, miscellaneous		1,500
Total		$24,536

MERCED.

Area: 1,995 square miles.

Population: 15,148 (1910 census).

Location: About the geographical center of the state.

Merced County as a whole lies in the San Joaquin Valley, and it figures as one of the lesser mineral-producing counties of the state. The 1915 mineral output was valued at $94,032. Gold, platinum and silver, obtained by dredging, are among the important items. Copper and crushed rock have also been commercially produced. Undeveloped deposits of antimony, quicksilver, and limestone, have been noted in this county, in addition to the foregoing.

In forty-fourth place, commercial production during 1915 was as follows:

Substance	Amount	Value
Lead	690 lbs.	$32
Other minerals		94,000
Total		$94,032

MODOC.

Area: 3,823 square miles.

Population: 6,191 (1910 census).

Location: The extreme northeast corner of the state.

Modoc County, like Lassen, has only recently had the benefit of communication with the outside world by rail. Among its known mineral resources are: Clay, coal, gold, iron, quicksilver, salt, and silver.

In fifty-second place, commercial production for 1915 was as follows:

Substance	Value
Gold	$7,557
Silver	104
Stone, miscellaneous	300
Other minerals	720
Total	$8,681

MONO.

Area: 3,030 square miles.

Population: 2,843 (1910 census).

Location: Is bordered by the state of Nevada on the east and is about in the central portion of the state measured on a north and south line.

Gold mining has been carried on in portions of Mono County for many years, although taken as a whole it lies in a rather inaccessible country and has been but superficially explored. It is in the continuation of the highly mineralized belt which was noted in Inyo County and contains among other mineral resources barytes, bismuth, clay, copper, gold, gypsum, iron, lead, limestone, pumice, salt, silver, and travertine.

In forty-third place, commercial production for 1915 was as follows:

Substance	Value
Gold	$107,302
Silver	1,923
Other minerals	200
Total	$109,425

MONTEREY.

Area: 3,330 square miles.

Population: 24,146 (1910 census).

Location: West central portion of state, bordering on Pacific Ocean.

Monterey County produced seven mineral substances during the year 1915, having a total value of $84,986, as compared with the 1914 output worth $113,831. Its mineral resources include brick, clay, copper, coal, feldspar, fuller's earth, gold, silver, gypsum, infusorial earth, limestone, mineral water, petroleum, quicksilver, glass-sand, sandstone, silver, and miscellaneous stone.

In forty-fifth place, commercial production for 1915 was as follows:

Substance	Amount	Value
Mineral water	8,200 gals.	$2,050
Stone		32,799
Other minerals*		50,137
Total		$84,986

*Includes coal, feldspar, infusorial earth, quicksilver, silica.

NAPA.

Area: 783 square miles.

Population: 19,800 (1910 census).

Location: Directly north of San Francisco Bay—one of the "bay counties."

Napa, because of its production of structural and industrial materials, and quicksilver, stands twenty-second on the list of mineral-producing counties in California. Its mineral resources include asbestos, barytes, copper, cement, gypsum, magnesite, mineral water, quicksilver, sandstone, soapstone, and miscellaneous stone.

Commercial production for 1915 was as follows:

Substance	Amount	Value
Magnesite	1,050 tons	$9,450
Mineral water	133,387 gals.	73,535
Quicksilver	507 flasks	45,224
Stone, miscellaneous		108,387
Other minerals*		647,625
Total		$884,221

*Includes cement and sandstone.

NEVADA.

Area: 974 square miles.

Population: 14,955 (1910 census).

Location: North of Lake Tahoe, on the eastern border of the state.

Nevada, one of the mountain counties of California, though it led all others in its gold output for 1914, was dropped to second place in 1915 by the wonderful spurt of Amador County. Nevada County stands eighth on the list in regard to the value of its total mineral output, with a figure of $3,492,946, as compared with the 1914 production worth $3,329,179.

While this county actually produces little else in the mineral line aside from gold and silver, its resources cover a wide scope, including antimony, asbestos, barytes, bismuth, chromite, clay, copper, gems, iron, lead, mineral paint, pyrite, soapstone, and tungsten.

Commercial production for 1915 was as follows:

Substance	Amount	Value
Copper	1,817 lbs.	$318
Gold		3,466,722
Lead	1,567 lbs.	74
Silver		23,762
Stone, miscellaneous		500
Other minerals		1,570
Total		$3,492,946

ORANGE.

Area: 795 square miles.

Population: 34,436 (1910 census).

Location: Southwestern portion of state, bordering Pacific Ocean.

Orange County is one of the many in California which on casual inspection appears to be anything but a mineral-producing section. It stands, however, as the fourth county in the state in regard to the total value of mineral output, its highly productive oil fields making such a condition possible.

This county shows a loss in 1915, with a total value of mineral products of $6,617,112, from the 1914 output, worth $8,831,763.

Aside from the substances actually produced and noted in the table below, coal, gypsum, iron, infusorial earth, sandstone, and tourmaline have been found in Orange County.

Commercial production for 1915 was as follows:

Substance	Amount	Value
Brick	1,280 M.	$16,000
Copper	4 lbs.	1
Lead	364 lbs.	17
Natural gas	1,243,301 M cu. ft.	81,753
Petroleum	12,715,457 bbls.	6,510,314
Stone, miscellaneous		9,027
Total		$6,617,112

PLACER.

Area: 1,395 square miles.

Population: 18,237 (1910 census).

Location: Eastern border of state directly west of Lake Tahoe.

While standing only twentieth on the list of mineral-producing counties, Placer contains a wide variety of mineral substances which have never been commercially exploited. Its leading products are gold, granite, copper, and clay. Other mineral resources, many of them undeveloped, are: Asbestos, brick, chromite, coal, gems, iron, lead, limestone, magnesite, manganese, marble, quartz crystals, glass-sand, silver, soapstone, and miscellaneous stone.

Commercial production for 1915 was as follows:

Substance	Amount	Value
Brick	2,000 M	$10,000
Clay, pottery	49,126 tons	37,536
Gold		411,319
Lead	711 lbs.	33
Limestone	1,236 tons	2,432
Silver		24,543
Stone, miscellaneous		98,187
Other minerals*		346,810
Total		$963,860

*Includes asbestos and copper.

PLUMAS.

Area: 2,594 miles.

Population: 5,259 (1910 census).

Location: Northeastern border of state, south of Lassen.

A considerable portion of the area of Plumas County lies in the high mountains, and deposits of the metals, especially gold and copper, are found there. Lack of transportation and other facilities have retarded its growth, but its future is decidedly promising. Mineral production for 1915 was valued at $745,515, as compared with the 1914 output, worth $164,809, the increase being largely due to copper.

Among its mineral resources are: Chromite, copper, gold, granite, iron, lead, limestone, manganese, platinum minerals, silver, tungsten, and zinc.

In twenty-fourth place, commercial production for 1915 was as follows:

Substance	Amount	Value
Copper	3,164,496 lbs.	$553,787
Gold		167,440
Silver		19,025
Stone, miscellaneous		5,431
Other minerals		32
Total		$745,715

RIVERSIDE.

Area: 7,240 square miles.

Population: 34,696 (1910 census).

Location: Southern portion of state.

Riverside is the fourth county in the state in size and the seventeenth in regard to the total value of mineral output for 1915. Within its borders are included mountain, desert, and agricultural land. Its mineral resources include metals, structural and industrial materials, and salines, some of the more important being asbestos, borax, brick, cement, clay, coal, copper, gems, gold, graphite, gypsum, iron, lead, limestone, manganese, magnesite, marble, mineral paint, mineral water, nitre, salt, glass-sand, soapstone, silver, miscellaneous stone, and tin.

Commercial production for 1915 was as follows:

Substance	Amount	Value
Brick	1,055 M.	$16,880
Clay, pottery	59,564 tons	54,840
Copper	23,825 lbs.	4,169
Gold	----------	10,769
Gypsum	3,450 tons	13,650
Lead	32,072 lbs.	1,507
Mineral water	200,000 gals.	10,000
Silver	----------	1,522
Stone, miscellaneous	----------	213,440
Other minerals*	----------	1,022,814
Total	----------	$1,349,591

*Includes cement, potash and silica.

SACRAMENTO.

Area: 983 square miles.

Population: 90,000 (estimate by Chamber of Commerce, 1913).

Location: North central portion of state.

Sacramento stands twelfth among the counties of the state as a mineral producer, the output, principally gold, for 1915 being valued at $2,562,281, as compared with the 1914 production, worth $2,632,658. In regard to gold output alone this county ranks fourth, being exceeded only by Amador, Nevada, and Yuba counties. Its mineral resources include: Brick, clay, gold, natural gas, platinum, silver, and miscellaneous stone.

Commercial production for 1915 was as follows:

Substance	Amount	Value
Brick	9,920 M.	$82,973
Gold		2,131,813
Platinum	196 ounces	6,217
Silver		3,151
Stone, miscellaneous		284,127
Other minerals.		54,000
Total		$2,562,281

SAN BENITO.

Area: 1,392 square miles.

Population: 8,041 (1910 census).

Location: West central portion of state.

Although twenty-sixth among the counties of the state in regard to value of total mineral production, San Benito leads in one important branch of the mineral industry, namely, quicksilver.

Its other mineral resources, many of them undeveloped, include: Antimony, bituminous rock, chromite, coal, gypsum, gems, limestone, mineral water, soapstone, and miscellaneous stone.

Commercial production for 1915 was as follows:

Substance	Amount	Value
Brick	260 M.	$1,560
Dolomite	2,500 tons	9,500
Mineral water	1,200 gals.	300
Quicksilver	6,291 flasks	475,370
Stone, miscellaneous		155,000
Other minerals		335
Total		$642,065

SAN BERNARDINO.

Area: 20,157 square miles.

Population: 75,000 (estimate by Board of Supervisors, 1913).

Location: Southeastern portion of state.

San Bernardino, by far the largest county in the state, ranks eleventh as regards the value of its mineral output for 1915, with a total of $2,674,042, as compared with the 1914 total of $1,614,606. The marked increase is due mainly to tungsten and gold, the well-known Atolia district contributing the former.

This county, consisting largely of mountain and desert country, is highly mineralized, a few of the more important mineral resources

being: Asbestos, barytes, borax, brick, cement, clay, copper, gems, gold, gypsum, iron, lead, limestone, manganese, marble, mineral paint, mineral water, nitre, potash, salt, glass-sand, silver, soapstone, soda, miscellaneous stone, talc, tungsten, tuff, vanadium, and zinc.

Commercial production for 1915 was as follows:

Substance	Amount	Value
Brick	400 M.	$2,400
Cement	915,000 bbls.	980,000
Copper	209,440 lbs.	36,652
Gold		416,967
Lead	169,183 lbs.	7,952
Limestone	68,500 tons	68,500
Mineral water	37,480 gals.	7,350
Salt	542 tons	3,324
Silver		64,165
Stone, miscellaneous		178,528
Tungsten concentrates	864 tons	840,947
Zinc	39,848 lbs.	4,941
Other minerals*		62,316
Total		$2,674,042

*Includes dolomite, gypsum, lime, manganese, marble, mineral paint, soapstone and talc

SAN DIEGO.

Area: 4,221 square miles.

Population: 140,000 (estimate by Chamber of Commerce, 1913).

Location: Extreme southwest corner of state.

San Diego, first in California in the production of gem stones, ranks thirty-sixth in the total value of its mineral output. This figure for 1915 equaled $211,129, as compared to the 1914 output, worth $315,267. Aside from minerals commercially produced, as shown below, San Diego County contains deposits of asbestos, bismuth, lithia mica, marble, potash, soapstone, tin, and tungsten.

A new development is the shipping of pebbles for grinding mills.

Commercial production for 1915 was as follows:

Substance	Amount	Value
Brick	1,260 M.	$21,025
Copper	3,008 lbs.	526
Gems		2,465
Gold		1,364
Lead	23 lbs.	1
Mineral water	10,350 gals.	1,035
Salt	17,616 tons	19,616
Silver		9
Stone, miscellaneous		163,723
Other minerals		1,365
Total		$211,129

SAN FRANCISCO.

Area: 43 square miles.

Population: 527,000 (estimate by Chamber of Commerce, 1915).

Surprising as it may appear at first glance, San Francisco County is listed among the mineral producing sections of the state, actual production consisting of crushed rock, sand, and gravel. Small quantities of various valuable mineral substances are found here, including cinnabar, gypsum, lignite, and magnesite, none, however, in paying quantities.

In forty-second place, commercial production for 1915 was as follows:

Substance	Value
Stone, miscellaneous	$128,270
Total	$128,270

SAN JOAQUIN.

Area: 1,448 square miles.

Population: 50,731 (1910 census).

Location: Central portion of state.

San Joaquin County reported a mineral production for the year 1915 having a total value of $248,394, as compared with the 1914 output, worth $129,930. Comparatively few mineral substances are found here, the chief ones being brick, clay, infusorial earth, manganese, natural gas, glass-sand, and miscellaneous stone.

In thirty-fourth place, commercial production for 1915 was as follows:

Substance	Amount	Value
Brick	3,000 M.	$75,000
Manganese	460 tons	7,400
Natural gas	161,923 M cu. ft.	143,974
Stone, miscellaneous		21,620
Other minerals		400
Total		$248,394

SAN LUIS OBISPO.

Area: 3,334 square miles.

Population: 19,383 (1910 census).

Location: Bordered by Kern County on the east and the Pacific Ocean on the west.

The total value of the mineral production of San Luis Obispo County in 1915 was $227,632, as compared with the 1914 output, worth $63,465.

Among its mineral resources, both developed and undeveloped, are: Asphalt, bituminous rock, brick, chromite, coal, copper, gold, gypsum, infusorial earth, limestone, marble, mineral water, onyx, petroleum, quicksilver, silver, and miscellaneous stone.

In thirty-fifth place, commercial production for 1915 was as follows:

Substance	Amount	Value
Mineral water	4,500 gals.	$675
Quicksilver	1,473 flasks	125,542
Stone, miscellaneous		99,475
Other minerals*		1,940
Total		$227,632

*Includes bituminous rock and chrome.

SAN MATEO.

Area: 447 square miles.

Population: 37,500 (estimate by county board of supervisors, 1913).

Location: Peninsula, adjoined by San Francisco on the north.

San Mateo's most important mineral products are limestone and salt, the latter being derived by evaporation from the waters of San Francisco Bay. The total value of all mineral production during 1915 equaled $177,891, as compared with the 1914 figures of $246,478.

Small amounts of barytes, chromite, infusorial earth and quicksilver have been discovered in addition to the items of economic value noted below.

In thirty-ninth place, commercial production for 1915 was as follows:

Substance	Amount	Value
Brick	715 M.	$19,550
Gems		100
Salt	25,500 tons	63,750
Stone, miscellaneous		93,391
Other minerals		1,100
Total		$177,891

SANTA BARBARA.

Area: 2,740 square miles.

Population: 27,738 (1910 census).

Location: Southwestern portion of state, joining San Luis Obispo on the south.

Santa Barbara County owes its position as seventh in the state in regard to its mineral product to the presence of productive oil fields

within its boundaries. The total value of its mineral production during the year 1915 was $3,984,966, as compared with the 1914 output of $2,686,309. Santa Barbara, in company with only Fresno and Santa Clara, showed an increase in petroleum valuation for 1915.

Aside from the mineral substances listed below, Santa Barbara County contains asphalt, diatomaceous earth, gilsonite, gypsum, magnesite, and quicksilver in more or less abundance.

Commercial production for 1915 was as follows:

Substance	Amount	Value
Brick	1,800 M.	$14,400
Limestone	5,956 tons	10,006
Mineral water	189,026 gals.	156,175
Natural gas	3,193,368 M cu. ft.	279,697
Petroleum	5,634,534 bbls.	3,442,700
Sandstone	29,900 cu. ft.	6,488
Stone, miscellaneous		13,900
Other minerals*		61,600
Total		$3,984,966

*Includes infusorial earth and quicksilver.

SANTA CLARA.

Area: 1,328 square miles.

Population: 97,039 (estimate by Chamber of Commerce, 1913).

Location: West central portion of state.

Santa Clara County reported a mineral output for 1915 of $635,229 as compared with the 1914 figures of $266,956. This county, lying largely in the Coast Range of mountains, contains a wide variety of mineral substances, including brick, chrome, clay, limestone, magnesite, manganese, mineral water, petroleum, quicksilver, soapstone, and miscellaneous stone. It stood second in quicksilver yield for the year.

In twenty-seventh place, commercial production for 1915 was as follows:

Substance	Amount	Value
Brick	10,096 M.	$57,784
Magnesite	7,623 tons	74,607
Mineral water	38,400 gals.	16,770
Petroleum	16,617 bbls.	11,067
Quicksilver	4,386 flasks	376,319
Stone, miscellaneous		98,342
Other minerals		340
Total		$635,229

SANTA CRUZ.

Area: 435 square miles.

Population: 26,140 (1910 census).

Location: Bordering Pacific Ocean, just south of San Mateo County.

The mineral output of Santa Cruz County, a portion of which is itemized below, amounted to a total value of $1,581,511, giving the county a standing of fifteenth among all others in the state in this regard, though a slight decrease from the previous year's total.

Among the mineral resources known here are bituminous rock, cement, coal, graphite, gold, lime, limestone, petroleum, silver, and miscellaneous stone.

Commercial production for 1915 was as follows:

Substance	Amount	Value
Bituminous rock	17,399 tons	$60,728
Lime	191,643 bbls.	177,873
Limestone	2,047 tons	4,873
Stone, miscellaneous		6,794
Other minerals		1,331,263
Total		$1,581 531

SHASTA.

Area: 3,858 square miles.

Population: 18,920 (1910 census).

Location: North central portion of state.

Shasta County stands second in California among the mineral-producing counties, with an output valued at $8,350,133, as compared with the 1914 production, worth $5,044,930. Not taking petroleum into account, Shasta leads all the counties by a wide margin. This county is first in copper production, first in silver, first in pyrite, first in zinc, and seventh in gold. The Shasta copper belt is the most important deposit of this metal on the Pacific coast, and the present production would be practically doubled were it not for the conflict between the agricultural interests and the smelters regarding the alleged damage done to crops by the smelter fumes. Some of the smelters have been closed by injunction and others have been forced to curtail their output in the effort to render their gaseous waste innocuous. The situation is showing improvement.

Shasta's mineral resources include: Asbestos, barytes, brick, chrome, coal, copper, gold, iron, lead, lime, limestone, mineral water, molybdenum, pyrite, silver, miscellaneous stone, and zinc.

Lassen Peak is located in southeastern Shasta County.

Commercial production for 1915 was as follows:

Substance	Amount	Value
Brick	1,836 M.	$11,550
Chrome	1,757 tons	17,570
Copper	30,828,917 lbs.	5,395,060
Gold		1,120,848
Lead	180,936 lbs.	8,504
Limestone	44,953 tons	40,945
Mineral water	12,000 gals.	1,800
Silver		459,566
Stone, miscellaneous		1,418
Zinc	8,378,401 lbs.	1,038,922
Other minerals*		253,950
Total		$8,350,133

*Includes iron ore, pyrite and lime.

SIERRA.

Area: 923 square miles.

Population: 4,098 (1910 census).

Location: Eastern border of state, just north of Nevada County.

Sierra County reported a mineral production of $729,518, consisting of gold and silver, during the year 1915, as compared with the 1914 output, worth $733,000. Considering gold output alone, this county stands ninth; and as to total mineral yield, twenty-fifth.

Aside from the metals itemized below, Sierra County contains deposits of asbestos, chromite, iron, lead, platinum minerals, serpentine, and talc.

Commercial production for 1915 was as follows:

Substance	Value
Gold	$726,362
Silver	3,156
Total	$729,518

SISKIYOU.

Area: 6,256 square miles.

Population: 18,800 (1910 census).

Location: Extreme north central portion of state, next Oregon boundary.

Siskiyou, fifth county in California in regard to size, located in a highly mineralized and mountainous country, ranks twenty-eighth in regard to the value of its mineral output for 1915. Although the county is traversed by a transcontinental railroad in a north and south

line, the mineral-bearing sections are almost without exception far from transportation and other facilities. A large part of the county is accessible by trail alone. Future development and exploitation will doubtless increase the productiveness of this part of the state to a great degree.

Among Siskiyou's mineral resources are: Chromite, clay, coal, copper, gems, gold, lead, limestone, marble, mineral water, pumice, quicksilver, sandstone, silver, and miscellaneous stone.

Commercial production for 1915 was as follows:

Substance	Amount	Value
Gold		$426,716
Lead	188 lbs.	9
Lime	745 bbls.	745
Mineral water	626,680 gals.	62,990
Silver		2,081
Stone, miscellaneous		4,630
Other minerals*		16,923
Total		$514,091

*Includes chrome, copper, marble, sandstone.

SOLANO.

Area: 822 square miles.

Population: 27,559 (1910 census).

Location: Touching San Francisco Bay on the northeast.

Solano, while mostly valley land, produced mineral substances during the year 1915 to the total value of $1,335,923, ranking sixteenth among the counties of the state. Among her mineral resources are: Brick, cement, clay, fuller's earth, limestone, mineral water, natural gas, onyx, petroleum, quicksilver, salt, and miscellaneous stone.

Commercial production for 1915 was as follows:

Substance	Amount	Value
Mineral water	64,200 gals.	$8,000
Stone, miscellaneous		37,576
Other minerals*		1,290,347
Total		$1,335,923

*Includes cement, fuller's earth, natural gas, quicksilver, salt.

SONOMA.

Area: 1,577 square miles.

Population: 48,394 (1910) census).

Location: South of Mendocino County, bordering on the Pacific Ocean.

Sonoma ranked thirty-third among the counties of California during the year 1915, with a mineral production of $276,104, as compared with its 1914 output worth $326,144. More paving blocks are turned out here than in any other section of the state.

Among Sonoma's mineral resources are: Brick, chromite, clay, copper, graphite, infusorial earth, magnesite, marble, mineral paint, mineral water, quicksilver, and miscellaneous stone.

Commercial production for 1915 was as follows:

Substance	Amount	Value
Magnesite	3,624 tons	$34,788
Mineral water	258,600 gals.	41,231
Quicksilver	159 flasks	21,793
Stone, miscellaneous		177,917
Other minerals		375
Total		$276,104

STANISLAUS.

Area: 1,450 square miles.

Population: 35,000 (estimated by the county board of supervisors).

Location: Center of state, bounded on south by Merced County.

Gold is the chief mineral product of Stanislaus County, although brick, clay, gypsum, iron, manganese, mineral paint, quicksilver, and silver are found here to some extent as well. This county, for 1915, ranks thirty-seventh in the state in regard to value of minerals, with an output of $191,771. In order not to reveal individual business, the gold, platinum, and silver yield of its single dredge is combined with the data of other minerals.

Commercial production for 1915 was as follows:

Substance	Value
Stone, miscellaneous	$2,250
Other minerals*	189,521
Total	$191,771

*Includes gold, mineral paint, silver, platinum, quicksilver.

SUTTER.

Area: 608 square miles.

Population: 6,329 (1910 census).

Location: Bounded by Butte County on the north and Sacramento on the south.

Sutter is one of only two counties in the state which reported no commercial output of some kind of mineral substance during 1915. Both clay and coal exist here, but deposits of neither mineral have been placed on a productive basis.

TEHAMA.

Area: 2,893 square miles.

Population: 11,401 (1910 census).

Location: North central portion of the state, bounded on the north by Shasta.

Tehama stands fifty-third among the fifty-six mineral-producing counties of the state. Its mineral output during 1915 was valued at $4,702, as compared with the 1914 production, worth $300.

Among its mineral resources are listed: Brick, chromite, copper, gold, marble, mineral water, salt, silver, and miscellaneous stone.

Commercial production for 1915 was as follows:

Substance	Amount	Value
Brick	400 M.	$2,700
Mineral water	1,000 gals.	500
Stone, miscellaneous		750
Other minerals*		752
Total		$4,702

*Includes chrome and salt.

TRINITY.

Area: 3,166 square miles.

Population: 3,301 (1910 census).

Location: Northwestern portion of state.

Trinity, like Siskiyou County, requires transportation facilities to further the development of its many and varied mineral resources. Deposits of asbestos, barytes, chromite, copper, gold, mineral water, platinum, quicksilver, silver, and building stone are known here, but with the exception of gold and copper, very little active production of these mineral substances is possible, as yet.

In twenty-ninth place, commercial output for 1915 was:

Substance	Amount	Value
Gold		$441,846
Mineral water	120 gals.	360
Platinum	13 ounces	435
Silver		3,470
Stone, miscellaneous		900
Other minerals		52,500
Total		$499,511

TULARE.

Area: 4,856 square miles.

Population: 35,440 (1910 census).

Location: Bounded by Inyo on the east, Kern on the south, Fresno on the north.

Tulare stands thirty-eighth on the list of mineral-produeing counties. Her mineral resources, among others, are: Brick, clay, copper, feldspar, graphite, gems, limestone, magnesite, marble, natural gas, quartz, glass-sand, soapstone, miscellaneous stone, and zinc. Tulare leads the state in magnesite output.

Commercial production for 1915 was as follows:

Substance	Amount	Value
Brick	5,520 M.	$33,364
Feldspar	1,800 tons	6,500
Limestone	1,349 tons	1,888
Magnesite	11,574 tons	104,166
Stone, miscellaneous		36,851
Other minerals*		1,830
Total		$184,599

*Includes chrome and silica.

TUOLUMNE.

Area: 2,190 square miles.

Population: 9,979 (1910 census).

Location: East central portion of state—Mother Lode district.

Tuolumne ranks nineteenth among the counties of the state relative to its total value of mineral output. As a producer of marble its standing is first.

Chromite, clay, copper, gold, lead, limestone, marble, mineral paint, platinum, soapstone, silver, and miscellaneous stone, are among its mineral resources.

Commercial production for 1915 was as follows:

Substance	Amount	Value
Chrome	352 tons	$2,352
Copper	27,667 lbs.	4,842
Gold	----------	1,058,103
Lead	1,779 lbs.	84
Limestone	8,859 tons	11,349
Silver	----------	13,480
Stone, miscellaneous	----------	1,900
Other minerals*	----------	79,328
Total	----------	$1,171,438

*Includes dolomite, lime and marble.

VENTURA.

Area: 1,878 square miles.

Population: 18,347 (1910 census).

Location: Southwestern portion of state, bordering on Pacific Ocean.

Ventura is the twenty-first county in the state in respect to the value of its mineral production for 1915, the exact figure being $904,767, as compared with the output for 1914, worth $1,000,729.

The highest gravity petroleum produced in the state is found here.

Among its other mineral resources are: Asphalt, borax, brick, clay, mineral water, natural gas, sandstone, and miscellaneous stone.

Commercial production for 1915 was as follows:

Substance	Amount	Value
Brick	200 M.	$2,500
Natural gas	491,879 M cu. ft.	29,670
Petroleum	1,017,220 bbls.	869,723
Stone, miscellaneous	----------	2,674
Other minerals	----------	200
Total	----------	$904,767

YOLO.

Area: 1,014 square miles.

Population: 13,926 (1910 census).

Location: Sacramento Valley, bounded by Sutter on the east and Colusa on the north.

The mineral production from Yolo County during the year 1915 consisted principally of quicksilver and miscellaneous stone valued at $2,040, ranking it in fifty-fifth place. Deposits of undetermined value of iron and sandstone have been discovered within the confines of this county.

Commercial production for 1915 was as follows:

Substance	Value
Stone, miscellaneous	$1,200
Other minerals	840
Total	$2,040

YUBA.

Area: 639 square miles.

Population: 10,042 (1910 census).

Location: Lies west of Sierra and Nevada counties; south of Plumas.

Yuba is tenth of the fifty-six mineral producing counties of the state, and is third in regard to gold output. Quicksilver and iron deposits have been reported in this county, aside from the following commercial production as reported for the year 1915:

Substance	Amount	Value
Gold		$2,703,710
Platinum	132 ounces	4,174
Silver		5,254
Stone, miscellaneous		149,292
Total		$2,862,430

CHAPTER EIGHT.

MINING LAWS.

The fundamental Federal and California statutes governing mining, the California mine bell signals and forms of location notices are given herewith.

MINING BUREAU ACT.

Chapter 679.

[Stats., 1913.]

An act establishing a state mining bureau, creating the office of state mineralogist, fixing his salary and prescribing his powers and duties; providing for the employment of officers and employees of said bureau, making it the duty of persons in charge of mines, mining operations and quarries to make certain reports, providing for the investigation of mining operations, dealings and transactions and the prosecution for defrauding, swindling and cheating therein, creating a state mining bureau fund for the purpose of carrying out the provisions of this act and repealing an act entitled "An act to provide for the establishment, maintenance, and support of a bureau, to be known as the state mining bureau, and for the appointment and duties of a board of trustees, to be known as the board of trustees of the state mining bureau, who shall have the direction, management and control of said state mining bureau, and to provide for the appointment, duties, and compensation of a state mineralogist, who shall perform the duties of his office under the control, direction and supervision of the board of trustees of the state mining bureau," approved March 23, 1893, and all acts amendatory thereof and supplemental thereto or in conflict herewith.

[Approved June 16, 1913. In effect August 10, 1913.]

The people of the state of California do enact as follows:

SECTION 1. There is hereby created and established a state mining bureau. The chief officer of such bureau shall be the state mineralogist, which office is hereby created.

SEC. 2. It shall be the duty of the governor of the state of California and he is hereby empowered to appoint a citizen and resident of this state, having a practical and scientific knowledge of mining, to the office of state mineralogist. Said state mineralogist shall hold his office at the pleasure of the governor. He shall be a civil executive officer. He shall take and subscribe the same oath of office as other state officers. He shall receive for his services a salary of three hundred dollars ($300) per month, to be paid at the same time and in the same manner as the salaries of other state officers. He shall also receive his necessary traveling expenses when traveling on the business of his office. He shall give bond for the faithful performance of his duties in the sum of ten thousand dollars ($10,000), said bond to be approved by the governor of the state of California.

SEC. 3. Said state mineralogist shall employ competent geologists, field assistants, qualified specialists and office employees when necessary in the execution of his plans and operations of the bureau, and fix their compensation. The said employees shall be allowed their necessary traveling expenses when traveling on the business of said department and shall hold office at the pleasure of said state mineralogist.

SEC. 4. It shall be the duty of said state mineralogist to make, facilitate, and encourage, special studies of the mineral resources and mineral industries of the state. It shall be his duty: to collect statistics concerning the occurrence and production of the economically important minerals and the methods pursued in making

their valuable constituents available for commercial use; to make a collection of typical geological and mineralogical specimens, especially those of economic and commercial importance, such collection constituting the museum of the state mining bureau; to provide a library of books, reports, drawings, bearing upon the mineral industries, and sciences of mineralogy and geology, and arts of mining and metallurgy, such library constituting the library of the state mining bureau; to make a collection of models, drawings and descriptions of the mechanical appliances used in mining and metallurgical processes; to preserve and so maintain such collections and library as to make them available for reference and examination, and open to public inspection at reasonable hours; to maintain, in effect, a bureau of information concerning the mineral industries of this state, to consist of such collections and library, and to arrange, classify, catalogue, and index the data therein contained, in a manner to make the information available to those desiring it; to issue from time to time such bulletins as he may deem advisable concerning the statistics and technology of the mineral industries of this state.

SEC. 5. It is hereby made the duty of the owner, lessor, lessee, agent, manager or other person in charge of each and every mine, of whatever kind or character, within the state, to forward to the state mineralogist, upon his request, at his office not later than the thirtieth day of June, in each year, a detailed report upon forms which will be furnished showing the character of the mine, the number of men then employed, the method of working such mine and the general condition thereof, the total mineral production for the past year, and such owner, lessor, lessee, agent, manager or other person in charge of any mine within the state must furnish whatever information relative to such mine as the state mineralogist may from time to time require for the proper discharge of his official duties. Any owner, lessor, lessee, agent, manager or other person in charge of each and every mine, of whatever kind or character within the state, who fails to comply with the above provisions shall be deemed guilty of a misdemeanor.

SEC. 6. The state mineralogist now performing the duties of the office of state mineralogist shall perform the duties of the office of state mineralogist as in this act provided until the appointment and qualification of his successor as in this act provided.

SEC. 7. The said state mineralogist shall take possession, charge and control of the offices now occupied and used by the board of trustees and state mineralogist and the museum, library and laboratory of the mining bureau located in San Francisco as provided for by a certain act of the legislature approved March 23, 1893, and hereafter referred to in section fourteen hereof, and shall maintain such offices, museum, library and laboratory for the purposes provided in this act.

SEC. 8. Said state mineralogist or qualified assistant shall have full power and authority at any time to enter or examine any and all mines, quarries, wells, mills, reduction works, refining works and other mineral properties or working plants in this state in order to gather data to comply with the provisions of this act.

SEC. 9. The state mineralogist shall make a biennial report to the governor on or before the fifteenth day of September next preceding the regular session of the legislature.

SEC 10. All moneys received by the state mining bureau or any officer thereof (except such as may be paid to them by the state for disbursement) shall be receipted for by the state mineralogist or other officer authorized by him to act in his place and at least once a month accounted for by him to the state controller and paid into the state treasury to the credit of a fund which is hereby created and designated "state mining bureau fund." All moneys now in the possession of the state mining bureau or any officer thereof received from any source whatsoever, shall be immediately paid over to the state mineralogist and by him accounted for to the controller and paid into the state treasury to the credit of said fund. Said fund shall be used and is hereby appropriated for the use of said bureau in carrying out the purposes of this act.

SEC. 11. The said state mineralogist is hereby authorized and empowered to receive on behalf of this state, for the use and benefit of the state mining bureau,

gifts, bequests, devices and legacies of real or other property and to use the same in accordance with the wishes of the donors, and if no instructions are given by said donors, to manage, use, and dispose of the gifts and bequests and legacies for the best interests of said state mining bureau and in such manner as he may deem proper.

SEC. 12. The state mineralogist may, whenever he deems it advisable, prepare a special collection of ores and minerals of California to be sent to or used at any world's fair or exposition in order to display the mineral wealth of the state.

SEC. 13. The state mineralogist is hereby empowered to fix a price upon and to dispose of to the public, at such price, any and all publications of the state mining bureau, including reports, bulletins, maps, registers or other publications, such price shall approximate the cost of publication and distribution. Any and all sums derived from such disposition, or from gifts or bequests made, as hereinbefore provided must be accounted for by said state mineralogist and turned over to the state treasurer to be credited to the mining bureau fund as provided for in section ten. He is also empowered to furnish without cost to public libraries the publications of the bureau, and to exchange publications with other geological surveys and scientific societies, etc.

SEC. 14. The state mineralogist provided for by this act shall be the successor in interest of the board of trustees of the state mining bureau, and the state mineralogist, under and by virtue of that certain act, entitled "An act to provide for the establishment, maintenance, and support of a bureau, to be known as the state mining bureau, and for the appointment and duties of a board of trustees, to be known as the board of trustees of the state mining bureau, who shall have the direction, management, and control of said state mining bureau, and to provide for the appointment, duties, and compensation of a state mineralogist, who shall perform the duties of his office under the control, direction and supervision of the board of trustees of the state mining bureau," approved March 23, 1893, and all books, papers, documents, personal property, records, and property of every kind and description obtained or possessed, or held or controlled by the said board of trustees of the said state mining bureau, and the state mineralogist, and the clerks and employees thereof, under the provisions of said act of March 23, 1893, or any act supplemental thereto or amendatory thereof, shall immediately be turned over and delivered to the said state mineralogist herein provided for, who shall have charge and control thereof.

SEC. 15. That certain act entitled "An act to provide for the establishment, maintenance, and support of a bureau, to be known as the state mining bureau, and for the appointment and duties of a board of trustees, to be known as the board of trustees of the state mining bureau, and to provide for the appointment, duties and compensation of a state mineralogist, who shall perform the duties of his office under the control, direction, and supervision of the board of trustees of the state mining bureau," approved March 23, 1893, together with all acts amendatory thereof and supplemental thereto and all acts in conflict herewith are hereby repealed.

DEPARTMENT OF PETROLEUM AND GAS.

Chapter 718.

An act establishing and creating a department of the state mining bureau for the protection of the natural resources of petroleum and gas from waste and destruction through improper operations in production; providing for the appointment of a state oil and gas supervisor; prescribing his duties and powers; fixing his compensation; providing for the appointment of deputies and employees; providing for their duties and compensation; providing for the inspection of petroleum and gas wells; requiring all persons operating petroleum and gas wells to make certain reports; providing procedure for arbitration of departmental rulings; creating a fund for the purposes of the act; providing for assessment of charges to be paid by operators and providing for the collection thereof; and making an appropriation for the purposes of this act.

[Approved June 10, 1915.]

The people of the state of California do enact as follows:

SECTION 1. A separate department of the state mining bureau is hereby established and created to be known as the department of petroleum and gas. Such department shall be under the general jurisdiction of the state mineralogist. He shall appoint a supervisor who shall be a competent engineer or geologist experienced in the development and production of petroleum and who shall be designated the "state oil and gas supervisor," and whose term of office shall be four years from and after the date of his appointment.

SEC. 2. For his services in the general supervision of said department the state mineralogist shall receive as compensation one thousand four hundred dollars annually which shall be in addition to his compensation fixed in section two of the act of June 16, 1913, relating to the state mining bureau. The supervisor shall receive an annual salary of four thousand five hundred dollars, and shall be allowed his necessary traveling expenses. The state mineralogist may appoint necessary clerks, stenographers, and assistants, and prescribe their duties and fix their compensation, within the amount limited in section forty-six hereof and subject to the civil service laws of the state.

The additional salary herein authorized to be paid to the state mineralogist and the salaries of the supervisor and of the deputies, clerks, stenographers, assistants and other employees shall be paid out of the funds hereinafter provided for at the time and in the manner that salaries of other state officers and employees are paid.

SEC. 3. It shall be the duty of the state oil and gas supervisor so to supervise the drilling, operation and maintenance and abandonment of petroleum or gas wells in the state of California, as to prevent, as far as possible, damage to underground petroleum and gas deposits from infiltrating water and other causes and loss of petroleum and natural gas.

SEC. 4. It shall be the duty of the state oil and gas supervisor to appoint not more than four deputies and prescribe their duties, and fix their compensation. Such deputies shall serve during the pleasure of the supervisor. He may also employ an attorney and fix his compensation. The supervisor, the deputies, and the attorney shall not be subject to the civil service act.

SEC. 5. Each deputy appointed by the supervisor shall be a competent engineer or geologist experienced in the development and production of petroleum. Each deputy shall be assigned certain districts or territory, and shall maintain an office in the district, convenient of access to the petroleum or gas operators therein. The office shall be open and the deputy shall be present at certain specified times which shall be posted at such office.

SEC. 6. It shall be the duty of each deputy, to collect all necessary information regarding the oil wells in the district, with a view to determining the presence and source of water in the oil sand, and to make all maps and other accessories necessary to determine the presence and source of water in the oil sands. This work shall be

done with the view to advising the operators as to the best means of protecting the oil and gas sands, and with a view to aiding the supervisor in ordering tests or repair work at wells. All such data shall be kept on file in the office of the deputy oil and gas supervisor of the respective district.

SEC. 7. The records of any and all operators, when filed with the deputy supervisor as hereinafter provided, shall be open to inspection to those authorized in writing by such operators, to the state officers, and to the board of arbitration hereinafter provided for. Such records shall in no case be available as evidence in court proceedings and no officer or employee or member of any board of arbitration shall be allowed to give testimony as to the contents of said records, except at such court proceedings as are hereinafter provided for in the review of the decision of the state oil and gas supervisor, or a board of arbitration, and in criminal proceedings arising out of such records, or the statements upon which they are based.

SEC. 8. It shall be the duty of the supervisor to order such tests or remedial work as is in his judgment necessary to protect the petroleum and gas deposits from damage by underground water, to the best interest of the neighboring property owners and the public at large. The order shall be in written form, signed by the supervisor, and served upon the owner of the well or his local agent, in the manner provided in section eleven hereof. The order shall specify the work necessary to protect such deposits from damage from underground waters. For this purpose each operator or owner shall designate an agent, giving his post-office address, who resides within the county where the well or wells are located, upon whom all orders and notices provided for in this act may be served.

SEC. 9. The well owner, or his local agent, may within ten days from date of service of order from the supervisor, file with the supervisor, or his deputy in the district where the property is located, a statement that the supervisor's order is not acceptable and that arbitration of the subject is demanded.

SEC. 10. Arbitration of a question which has been the subject of an order by the supervisor shall be accomplished by a board of three members, as follows: (1) The owner of the well or his local agent shall name one member who shall not be directly or indirectly interested in the property, nor employed in its operation. (2) The owners, or their local agents, of wells within a radius of one mile from the affected well, shall name one member of the arbitration board, who shall not be directly or indirectly interested in the property nor employed in its operation. For this purpose the supervisor shall give written notice to each of the said owners or agents. The notice shall specify the time and place of meeting and the fact that it is for the purpose of choosing an arbitrator. The notice shall be published once in a newspaper of general circulation, published in the county where the meeting is to be held, and posted in a conspicuous place at the office of the deputy supervisor at least five days before the time of meeting, and a copy thereof mailed to each of such owners, or their local agents, at the address given, at least five days before the time of meeting. A majority of those attending such meeting shall be sufficient to choose such arbitrator. (3) The third member of the arbitration board shall be chosen by the other members, but if they fail to choose a third member within ten days after the selection of the first two members then such third member shall be chosen by the state mineralogist, and shall not be directly or indirectly interested in the property, nor employed in its operation. The arbitrators chosen as above specified shall each be paid ten dollars per day for each day of actual service, not to exceed thirty dollars each for any one case, upon warrants drawn upon the repair fund hereinafter created, and approved by the state mineralogist. One-half of the cost of arbitration shall be paid by the person demanding it and the board of arbitration may, at its discretion, order that the entire cost of such arbitration shall be paid by such person if it finds that such arbitration has been demanded needlessly or not in good faith.

SEC. 11. Upon receipt by the supervisor or deputy supervisor of a written complaint, signed by one-third of the individuals or corporations owning land or operating wells within a radius of one mile of any well, or group of wells, the supervisor must make an investigation of said well or wells and render a written order stating

the work required to repair the damage complained of, or stating that no work is required. A copy of such order must be delivered to each of the complainants and, if the supervisor order the damage repaired, a copy of such order shall be delivered to each of the owners, or agents, having in charge the wells upon which the work is to be done. Service of such copies shall be by mailing to such persons at the post office address given. Within ten days after the date of mailing of such order any of such complainants may demand arbitration of the matter as provided in section ten of this act. When said complaint is made by a single party against a well or wells, of which there is no financially responsible owner, the supervisor may order the necessary repair work, the expense of which shall be a charge against the complainant collectible as provided in section fourteen.

SEC. 12. In any proceedings before the board of arbitration herein provided for, the supervisor shall have the power to subpœna witnesses and to administer oaths; *provided, however*, that no person shall be required to attend upon such subpœnas, either with or without books, papers, documents or accounts, unless residing within the same county or within thirty miles of the place of attendance, but the supervisor may in such a case cause the deposition of witnesses residing within or without the state, to be taken in the manner prescribed by law for like depositions in civil actions in the superior courts of this state, and to that end may compel the attendance of witnesses and the production of books, papers, and documents at such places as he may designate within the limits hereinbefore prescribed. Witnesses shall be entitled to receive the fees and mileage fixed by law in civil cases. In case of failure on the part of any person to comply with any order of the supervisor, or any subpœna, or upon the refusal of any witness to testify to any matter regarding which he may lawfully be interrogated before the board, it shall be the duty of the superior court or the judge thereof, on application of the supervisor, to compel obedience in the same manner, by contempt proceedings or otherwise, that such obedience would be compelled in a proceeding pending before the court.

SEC. 13. Within ten days after hearing the evidence the arbitration board shall make a written decision ordering such tests or remedial work as is deemed necessary to protect the oil sands from damage by infiltrating water. This written decision shall be served upon the owner or his agent and shall supersede and nullify the previous order of the supervisor provided for in section eight hereof. In case no written decision is made by a board of arbitration within thirty days after the date of notice by the supervisor, as provided in section ten hereof, the order of the supervisor shall be effective and subject only to review by writ of certiorari from the superior court as provided in section fourteen hereof.

SEC. 14. On or before thirty days after the date of serving an order of the supervisor provided for in section eight hereof, or, in case of arbitration, on or before thirty days after date of serving the decision of the board, as provided in sections twelve and thirteen hereof, the owner shall commence in good faith the work ordered, and continue until completion. If the work has not been so commenced and continued to completion the supervisor shall appoint agents as he deems necessary, who shall enter the premises and perform the work. Accurate account of all such expenditures shall be kept and the amount paid from the fund hereinafter created upon the warrant of the state controller. Any amounts so expended shall constitute a lien against the property upon which the work is done. The decision of the board of arbitration or of the supervisor in such a case may be reviewed by writ of certiorari from the superior court of the county in which the district is situated, if taken within thirty days after the signing of the order. If no review is taken or, if taken, the decision of the board is affirmed, the lien upon the property shall be enforced in the same manner that other liens on real property are enforced and shall first be enforced against the owner of the well, against the operator and against the personal property and fixtures used in the construction or operation thereof, and then if there then be any deficiency, against the land upon which the work is done.

SEC. 15. It shall be the duty of the owner of any well now drilled, or that may be drilled, in the state of California, on lands producing or reasonably presumed to

contain petroleum or gas, to properly case such well or wells, with metal casing, in accordance with methods approved by the supervisor, and to use every effort and endeavor in accordance with the most approved methods to effectually shut off all water overlying or underlying the oil or gas-bearing strata, and to effectually prevent any water from penetrating such oil or gas-bearing strata.

SEC. 16. It shall be the duty of the owner of any well referred to in this act, before abandoning the same, to use every effort and endeavor in accordance with methods approved by the supervisor, to shut off and exclude all water from entering oil-bearing strata encountered in the well. The owner shall give written notice to the supervisor, or his local deputy, of his intention to abandon any well and the date when such work of abandonment shall begin. The notice shall be given to the supervisor, or his local deputy, at least fifteen days before such proposed abandonment. The owner shall furnish the supervisor, or his deputy, with such information as he may request, showing the condition of the well and proposed method of abandonment. The supervisor, or his deputy, shall before the proposed date of abandonment furnish the owner with a written order of approval of his proposal or a written order stating what work will be necessary before approval, to abandon, will be given. If the supervisor shall fail within the specified time to give the owner a written order such failure shall be considered as an approval of the owner's proposal to abandon the well.

SEC. 17. The owner of any well referred to in this act shall, before commencing the work of drilling an oil or gas well, file with the supervisor, or his local deputy, a written notice of intention to commence drilling. Such notice shall also contain the following information: (1) Statement of location and elevation above sea level of proposed derrick and drill rig. (2) The number or other designation by which such well shall be known, which number or designation shall not be changed after filing notice provided for in this section, without the written consent of the supervisor being obtained therefor. (3) The owner's estimate of the depth of the point at which water shall be shut off. (4) The owner's estimate of the depth at which oil or gas producing sand or formation shall be encountered. The provisions of this section shall also apply, so far as may be, to the deepening or redrilling of any well.

SEC. 18. It shall be the duty of the owner of any well referred to in this act, to keep a careful and accurate log of the drilling of such well, such log to show the character and depth of the formations passed through or encountered in the drilling of such well, and particularly to show the location and depth of the water-bearing strata, together with the character of the water encountered from time to time (so far as ascertained) and to show at what point such water was shut off, if at all, and if not, to so state in such log, and show completely the amounts, kinds and size of casing used, and show the depth at which oil-bearing strata is encountered, the depth and character of same, and whether all water overlying and underlying such oil-bearing strata was successfully and permanently shut off so as to prevent the percolation or penetration into such oil-bearing strata; such log shall be kept in the local office of the owner or operator and subject to the inspection of the supervisor or any of his deputies at any time during business hours, and a copy of said log shall be filed with the deputy supervisor immediately upon the completion of said well and also a complete copy shall be filed with the deputy supervisor upon the completion of any additional work upon the well. The owner of any well drilled previous to the enactment of this act shall furnish to the supervisor a complete and correct log of such well, so far as may be possible, together with a statement of the present condition of said well.

SEC. 19. It shall be the duty of the owner of any well referred to in this act to notify the deputy supervisor of the time at which the owner shall test the shut-off of water in any such well. Such notice shall be given at least five days before such test. The deputy supervisor shall be present at such test and shall himself note in the log book the result thereof. If any test shall be unsatisfactory to him he shall notify the owner of that fact.

SEC. 20. It shall be the duty of every person, association or corporation, producing oil in the state of California, to file with the supervisor at his request, but

not oftener than once in each month a sworn statement of the amount of oil produced, during the period indicated, its gravity and the number of wells drilling, producing, idle, or abandoned. This information shall be in such form as the supervisor may designate.

SEC. 21. Any owner or operator of a well referred to in this act, or employee thereof, who refuses to permit the supervisor, or his deputy, to inspect the same, or who wilfully hinders or delays the enforcement of this act, and every person, firm, or corporation, who violates any provision of this act, is guilty of a misdemeanor and shall be punishable by a fine of not less than one hundred dollars, or by imprisonment in the county jail for not less than thirty days, or by both such fine and imprisonment.

SEC. 22. Charges levied, assessed and collected as hereinafter provided upon the properties of every person, firm, corporation or association operating any oil well or wells for the production of petroleum in this state, or operating any well or wells for the production of natural gas in this state which gas wells are situate in counties having producing petroleum wells chargeable under this act, and on lands situate within two miles, as near as may be, of any petroleum or gas well the production of which is chargeable under this act, shall be used exclusively for the support and maintenance of the department of petroleum and gas hereinbefore created, and shall be assessed and levied by the state mineralogist, and collected in the manner hereinafter provided.

SEC. 23. Every person, firm, corporation or association operating any petroleum well or wells in this state shall annually pay a charge to the state treasurer at a uniform rate per barrel of petroleum produced for the preceding calendar year at the time and in the manner hereinafter provided, based upon a verified report as herein provided.

SEC. 24. Every person, firm, corporation or association operating any gas well or wells in this state shall annually pay a charge to the state treasurer based upon the amount of gas sold in the preceding calendar year at a fixed rate per thousand cubic feet, which rate shall be based upon the proportionate benefits resulting to the property so assessed by reason of the expenditures made under this act, in the county, in which each such well is located. Said charge shall be based upon a verified report as herein provided; *provided, further*, that no charges shall be assessed, levied, or collected from any person, firm, corporation, or association operating a gas well or wells in any county in which there exist no producing petroleum wells to be assessed under the provisions of this act.

SEC. 25. Every person, firm, corporation or association owning any oil land, as determined by the supervisor, shall annually pay a charge to the state treasurer at the time and in the manner hereinafter provided, which charge shall be a uniform rate per acre. Said charge shall be based upon a verified report as provided herein; *provided, however*, that such lands so assessed shall not be called upon to pay more than one-tenth of the total charges or moneys proposed to be assessed, levied and collected under the provisions of this act for any one year.

SEC. 26. The charges assessed, levied and to be collected under the provisions of this act shall be in addition to any and all charges, taxes, assessments or licenses of any kind or nature paid by or upon the properties assessed hereunder.

SEC. 27. The state mineralogist shall annually, on or before the first Monday in March, acting in conjunction with the state board of control, make an estimate of the amount of moneys which shall be required to carry out the provisions of this act.

SEC. 28. The state mineralogist shall prescribe the form and contents of all reports for making the charge or other purposes to carry out the intent and provisions of this act, which form shall be mailed in duplicate to the person, firm, corporation or association owning property or assessed under the provisions of this act.

SEC. 29. Every person, firm, corporation or association chargeable under the provisions of this act, shall within ten days after the first Monday in March of each year, report to and file with the state mineralogist, a report in such form as

said officer may prescribe, giving any and all items of information as may be demanded by said report, and necessary to carry out the provisions of this act, which report shall be verified by such person or officer as the state mineralogist may designate.

SEC. 30. If any person, firm, corporation or association chargeable under the provisions of this act shall fail or refuse to furnish the state mineralogist within the time prescribed in this act the verified report provided for in this act, the state mineralogist must note such failure or refusal in the record of assessments hereinafter in this act provided for, and must make an estimate of the petroleum or gas production, or landed area to be assessed of any such person, firm, corporation or association and must assess the same at the amount thus estimated and compute the charge thereon, which assessment and charge shall be the assessment and charge for such year. And if in the succeeding year any such person, firm, corporation or association shall again fail and refuse to furnish the verified report required by this act, the state mineralogist shall make an estimate as aforesaid, which estimate shall not be less than twice the amount of the estimate made by him for the previous year, and shall note such failure or refusal as above provided, and the said estimate so made shall be the assessment or charge for said year. In case of each succeeding consecutive failure or refusal the said state mineralogist shall follow the same procedure until a true statement or report shall be furnished.

SEC. 31. Any person, firm, corporation or association failing or refusing to make and furnish any report prescribed in this act or rendering a false or fraudulent report shall be guilty of a misdemeanor and subject to a fine of not less than three hundred dollars and not exceeding one thousand dollars for each such offense.

SEC. 32. The state mineralogist may, for good cause shown, by order entered upon his minutes, extend for not exceeding thirty days, the time fixed in this act for filing any report herein provided for.

SEC. 33. On or before the third Monday before the first Monday in July the state mineralogist shall determine the rate or rates which, when applied to the assessments provided for in this act, shall produce the sum necessary to be raised as provided in section twenty-seven of this act. Within the same time the said state mineralogist shall extend in the proper column of the record of assessments hereinafter provided for the amount of charges due from each person, firm, corporation or association.

SEC. 34. Between the first Monday in March and the third Monday before the first Monday in July in each year, the state mineralogist must assess and levy the charges as and in the manner provided for in this act. The assessments must be made to the person, firm, corporation or association owning or operating the property subject to assessment hereunder on the first Monday in March. If the name of the owner is unknown to the state mineralogist, such assessment must be made to unknown owners. Clerical errors occurring or appearing in the name of any person, firm, corporation or association whose property is properly assessed and charged, or in the making, or extension of any assessment or charge upon the records, which do not affect the substantial rights of the payer, shall not invalidate the assessment or charge.

SEC. 35. The state mineralogist and the chairman of the state board of control and the chairman of the state board of equalization shall constitute a board of review, correction and equalization, and shall have all the powers and perform such duties as usually devolve upon a county board of equalization under the provisions of section three thousand six hundred seventy-two of the Political Code. The state mineralogist shall act as secretary of said board, and shall keep an accurate minute of the proceedings thereof. Said board of review, correction and equalization shall meet at the state capitol on the third Monday before the first Monday in July of each year, and remain in session from day to day until the first Monday in July for the purpose of carrying out the provisions of this section.

SEC. 36. On the third Monday before the first Monday in July of each year the state mineralogist shall cause to be published a notice, one or more times, in a daily,

or weekly, or semi-weekly newspaper of general circulation published in the counties of Fresno, Kern, Los Angeles, Orange, Ventura and Santa Barbara, if one be published therein, otherwise in a newspaper of general circulation published in the county nearest to such county designated herein in which no such paper is published, that the assessment of property and levy of charges under and in pursuance of this act has been completed and that the records of assessments containing the charges due will be delivered to the state controller on the first Monday in July, and that if any person, firm, corporation or association is dissatisfied with the assessment made or charge fixed by the state mineralogist, he or it may, at any time before said first Monday in July, apply to said board of review, correction and equalization to have the same corrected in any particular. The said board shall have power at any time before said first Monday in July to correct the record of assessments and may increase or decrease any assessment or charge therein if in its judgment the evidence presented or obtained warrants such action. Costs of such publication in any county shall be paid from the repair fund of said county.

SEC. 37. The state mineralogist must prepare each year a book, in one or more volumes, to be called the "Record of Assessments and Charges for Oil Protection," in which must be entered, either in writing or printing, or both writing and printing, each assessment and levy or charge made by him upon the property provided to be assessed and charged under this act, describing the property assessed, and such assessments may be classified and entered in such separate parts of said record as said state mineralogist shall prescribe.

SEC. 38. On the first Monday in July the state mineralogist must deliver to the state controller the record of assessments and charges for oil protection, certified to by said state mineralogist, which certificate shall be substantially as follows: "I, _____, state mineralogist, do hereby certify that between the first Monday in March and the first Monday in July, 19__, I made diligent inquiry and examination to ascertain all property and persons, firms, corporations and associations subject to assessment for the purpose of oil protection as required by the provisions of the act of legislature approved _____, 19__, providing for the assessment and collection of charges for oil protection; that I have faithfully complied with all the duties imposed upon me by law; that I have not imposed any unjust or double assessment through malice or ill will, or otherwise; nor allowed any person, firm, corporation or association, or property to escape a just assessment or charge through favor or regard, or otherwise."

But the failure to subscribe such certificate to such record of assessments and charges for oil protection, or any certificate, shall not in any manner affect the validity of any assessment or charge.

It is the intention of this act that in the assessment of the lands as provided in section twenty-five hereof, and in carrying such assessments to the record of assessments aforesaid, the state mineralogist shall keep within two miles as near as may be of producing petroleum or gas wells as provided in said section twenty-five hereof.

SEC. 39. The charges levied and assessed under the provisions of this act shall be due and payable on the first Monday in July in each year, and one-half thereof shall be delinquent on the sixth Monday after the first Monday in July at six o'clock p.m. and unless paid prior thereto, fifteen per cent shall be added to the amount thereof, and unless paid prior to the first Monday in February next thereafter at six o'clock p.m., an additional five per cent shall be added to the amount thereof, and the unpaid portion, or the remaining one-half of said charges shall become delinquent on the first Monday in February next succeeding the day upon which they become due and payable, at six p.m.; and if not paid prior thereto five per cent shall be added to the amount thereof.

SEC. 40. Within ten days after the receipt of the record of assessments and charges for oil protection, the state controller must begin the publication of a notice to appear daily for five days, in one daily newspaper of general circulation published in each of the counties of Fresno, Kern, Los Angeles, Orange, Ventura and Santa Barbara, if one be published therein, otherwise for at least two times in a weekly

or semi-weekly paper of general circulation published therein, or if there be neither a daily, nor weekly nor semi-weekly paper of general circulation published in any one of such counties, then the publication of the notice for such county shall be made in a similar manner in a newspaper of general circulation published in the county nearest such county, specifying:

(1) That he has received from the state mineralogist the record of assessments and charges for oil protection.

(2) That the charges therein assessed and levied are due and payable on the first Monday in July and that one-half thereof will be delinquent on the sixth Monday after the first Monday in July at six o'clock p.m., and that unless paid to the state treasurer at the capitol prior thereto, fifteen per cent will be added to the amount thereof, and unless paid prior to the first Monday in February next thereafter at six o'clock p.m., an additional five per cent will be added to the amount thereof; and that the remaining one-half of said charges will become delinquent on the first Monday in February next succeeding the day upon which they become due and payable, at six o'clock p.m.; and if not paid to the state treasurer at the capitol prior thereto, five per cent will be added to the amount thereof. Costs of such publication in any county shall be paid from the repair fund of said county.

SEC. 41. The assessments and charges levied under the provisions of this act shall constitute a lien upon all the property of every kind and nature belonging to the persons, firms, corporations, and associations and assessed under the provisions hereof, which lien shall attach on the first Monday in March of each year. Every charge and assessment herein provided for has the effect of a judgment against the person, firm, corporation or association, and every lien created by this act has the effect of an execution duly levied against all property of the delinquent; the judgment is not satisfied nor the lien removed until such charges, penalties, and costs are paid, or the property sold for the payment thereof.

SEC. 42. All charges assessed and levied under the provisions of this act shall be paid to the state treasurer upon the order of the state controller. The controller must mark the date of payment of any charge on the record of assessments and charges for oil protection, and shall give a receipt for such payment in such form as the controller shall prescribe. Errors appearing in any assessment on said record of assessments or overcharges shall be corrected by the controller by and with the consent of the state board of control in such manner as said controller and said board shall agree upon.

SEC. 43. Any person, firm, corporation or association claiming and protesting as herein provided that the assessment made or charges assessed against him or it by the state mineralogist is void, in whole or in part, may bring an action against the state treasurer for the recovery of the whole or any part of such charge, penalties, or costs paid on such assessment upon the grounds stated in said protest, but no action may be brought later than the third Monday in February next following the day on which the charges were due, nor unless such person, firm, corporation or association shall have filed with the state controller at the time of payment of such charges a written protest stating whether the whole assessment or charge is claimed to be void, or if a part only, what part, and the grounds upon which such claim is founded; and when so paid under protest the payment shall in no case be regarded as voluntary.

Whenever, under the provisions of this section, an action is commenced against the state treasurer, a copy of the complaint and of the summons must be served upon the treasurer, or his deputy. At the time the treasurer demurs or answers, he may demand that the action be tried in the superior court of the county of Sacramento, which demand must be granted. The attorney general must defend the action, or may appoint any competent attorney to so defend, the expense of which employment shall be paid from the repair fund raised under the provisions of this act. The provisions of the Code of Civil Procedure relating to pleadings, proofs, trials, and appeals are applicable to the proceedings herein provided for.

A failure to begin such action within the time herein specified shall be a bar against the recovery of such charges. In any such action the court shall have the

power to render judgment for plaintiff for any part or portion of the charge, penalties, or costs found to be void and so paid by plaintiff upon such assessment.

SEC. 44. The state controller shall, on or before the thirtieth day of May next following the delinquency of any charge as provided in this act, bring an action in a court of competent jurisdiction in the county of Sacramento in the name of the people of the State of California, to collect any delinquent charges or assessments, together with any penalties, or costs, which have not been paid in accordance with the provisions of this act and appearing delinquent upon the records of assessments and charges for oil protection hereinbefore in this act provided for.

The attorney general, or some competent attorney appointed by him for that purpose, must prosecute such action, and the provisions of the Code of Civil Procedure relating to service of summons, pleadings, proofs, trials, and appeals are applicable to the proceedings herein provided for. In such action a writ of attachment may be issued, and no bond or affidavit previous to the issuing of said attachment is required. The special attorney herein authorized to be appointed to prosecute such action or actions shall be paid from the repair funds raised under the provisions of this act.

Payment of the charges and penalties, or amount of the judgment recovered in such action must be made to the state treasurer. In such actions the record of assessment and charges for oil protection, or a copy of so much thereof as is applicable in said action, duly certified by the controller, showing unpaid charges against any person, firm, corporation or association assessed by the state mineralogist, is prima facie evidence of the assessment upon the property, the delinquency, the amount of charges, penalties, and costs due and unpaid to the state, and that the person, firm, corporation or association is indebted to the people of the state of California in the amount of charges and penalties therein appearing unpaid, and that all the forms of law in relation to the assessment of such charges have been complied with.

SEC. 45. The first assessment under the provisions of this act shall be as of the first Monday in March, nineteen hundred sixteen, and the reports of petroleum production and sales of gas herein provided to be assessed shall be reported for the calendar year ending December thirty-first, nineteen hundred fifteen. The lands herein provided to be assessed and charged shall be assessed to the owners thereof as of the first Monday in March, nineteen hundred sixteen.

SEC. 46. All of the moneys paid to the state treasurer under this act shall be deposited to the credit of the "oil protection fund" which is hereby created. Of the moneys in such funds forty-five thousand dollars only, shall be set aside as a "supervision account" and shall be available annually for the support and maintenance of the department herein established, and for the necessary expenses of the controller in carrying out the provisions of this act. Any balance remaining in said account at the end of any fiscal year shall be carried over and made a part of the succeeding year's "supervision account"; *provided further*, that in the first assessment under this act, an amount equal to the sum appropriated in section fifty-one hereof, shall be added to the regular supervision account and also the amount of ten thousand dollars which shall be available for providing offices and equipment for the deputy supervisors. All moneys shall be drawn from such fund, for the purpose of this act, upon warrants drawn by the controller of the state, upon demands made by the state mineralogist, and audited by the state board of control.

SEC. 47. The moneys in such fund shall be expended under the direction of the state mineralogist. All moneys over and above the forty-five thousand dollars for support and maintenance shall be available for the actual repair of wells as specified in section fourteen, and for expenditures provided for in sections thirty-six, forty, forty-three and forty-four of this act. Moneys collected from any county shall be available for repair work only in said county. Expenditure on repair work, in any county, during one year, shall not exceed an amount equal to twenty-five dollars per producing oil well in said county, but in no county shall the amount exceed twenty-five thousand dollars, and the charges hereinbefore provided for shall be so

determined that such amount shall be available. All moneys received in repayment for repair work done under the order and direction of the supervisor, as hereinbefore provided, shall be returned to the repair fund of the county in which the work was done.

SEC. 48. On or before the first day of October in each and every year, the supervisor shall submit a report in writing to the state mineralogist showing the total number of barrels of petroleum produced in each county in the state during the previous fiscal year, together with the total cost for said year of supervision as shown by the "supervision account" and the net amount remaining therein available for the succeeding year's expense, also the total amount uncollected; such report shall also show the total amount collected in each county under the "County Repair Account" during such year, total amount expended for said purpose, the total amount still outstanding and not repaid, and the sum available for the next succeeding year. Such report shall also include such other information as the supervisor may deem advisable. The state mineralogist shall make public such statements promptly after receipt of the same from the supervisor for the benefit of all parties interested therein.

SEC. 49. All leases, licenses and assignments thereof or of any interest therein for, upon or concerning lands or tenements in this state, whereby a right is given or granted to operate or to sink or drill wells thereon for petroleum or gas, or either, or pertaining thereto, shall be filed for record forthwith, and recorded in the records of the county recorder of the county where the property is situated without delay, and not be removed until recorded. No such lease or license shall have any force or validity until it is filed for record as aforesaid, except as between parties thereto, unless the person claiming thereunder is in actual possession.

SEC. 50. Whenever the term "supervisor" is used in this act it shall be taken to mean the "state oil and gas supervisor," the term "oil" shall include "petroleum," the term "petroleum" shall include "oil," the term "gas" shall mean natural gas coming from the earth, the term "operator" shall mean any person, firm or corporation drilling, maintaining, operating, pumping, or in control of a well in any territory which the supervisor determines to be oil or gas producing territory, the term "owner" shall include "operator" when any oil or gas well is operated or has been operated or is about to be operated by any person, firm or corporation other than the owner thereof, and the term "operator" shall include "owner" when any such well is or has been or is about to be operated by or under the direction of the owner, except that all the provisions of this act relating to assessments for the purposes of this act based upon the annual production of oil or petroleum or sale of gas, as set forth in sections twenty-two to forty-five, inclusive of this act, shall apply only to a person, firm or corporation operating an oil or petroleum or gas well, and shall not apply to the owner of such well if some person, firm or corporation, other than such owner, has been actually operating the well during the whole period for which such annual charge is made, but in the event that the actual operation of any such well changes hands during such period, the charge shall be apportioned upon the basis of the oil or petroleum or gas produced, and the lien provided for in section forty-one of this act shall be a lien against the property of each and all such operators.

SEC. 51. There is hereby appropriated out of any moneys in the state treasury, not otherwise appropriated, the sum of twenty thousand dollars which said sum shall be immediately transferred by the state controller on the books of his office from the general fund to the "oil protection fund" created by section forty-six of this act.

The above mentioned fund shall be available for the uses of the state mineralogist for the maintenance of the department of petroleum and gas and for the necessary expenses of the controller in carrying out the provisions of this act. When the collections paid to the state treasurer, as herein provided, equal the sum of thirty thousand dollars then said sum of twenty thousand dollars shall be re-transferred from the oil protection fund to the general fund. The moneys received into the state treasury through the provisions of this act are hereby appropriated for the uses and purposes herein specified.

SEC. 52. If any section, subsection, sentence, clause or phrase of this act is for any reason held to be unconstitutional, such decision shall not affect the validity of the remaining portions of this act. The legislature hereby declares that it would have passed this act, and each section, subsection, sentence, clause, and phrase thereof, irrespective of the fact that any one or more other sections, subsections, sentences, clauses, or phrases be declared unconstitutional.

SEC. 53. This act shall be liberally construed to meet its purposes and the supervisor shall have all powers which may be necessary to carry out the purposes of this act, but the provisions of this act shall not apply to any land or wells situated within the boundaries of an incorporated city where the drilling of oil wells is prohibited.

SEC. 54. That certain act entitled "An act to prevent injury to oil, gas or petroleum-bearing strata or formations by the penetration or infiltration of water therein," approved March 20, 1909, together with all acts amendatory thereof and supplemental thereto and all acts in conflict herewith are hereby repealed. Nothing herein shall be construed as affecting the provisions of the act of June 16, 1913, establishing a state mining bureau.

TO PREVENT WASTING OF NATURAL GAS.

An act prohibiting the unnecessary wasting of natural gas into the atmosphere; providing for the capping or otherwise closing of wells from which natural gas flows; and providing penalties for violating the provisions of this act.

[Approved March 25, 1911.]

The people of the state of California, represented in senate and assembly, do enact as follows:

SECTION 1. All persons, firms, corporations and associations are hereby prohibited from wilfully permitting any natural gas wastefully to escape into the atmosphere.

SEC. 2. All persons, firms, corporations or associations digging, drilling, excavating, constructing or owning or controlling any well from which natural gas flows shall upon the abandonment of such well, cap or otherwise close the mouth of or entrance to the same in such a manner as to prevent the unnecessary or wasteful escape into the atmosphere of such natural gas. And no person, firm, corporation or association owning or controlling land in which such well or wells are situated shall wilfully permit natural gas flowing from such well or wells, wastefully or unnecessarily to escape into the atmosphere.

SEC. 3. Any person, firm, corporation or association who shall wilfully violate any of the provisions of this act shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be punished by a fine of not more than one thousand dollars or by imprisonment in the county jail for not more than one year, or by both such fine and imprisonment.

SEC. 4. For the purposes of this act each day during which natural gas shall be wilfully allowed wastefully or unnecessarily to escape into the atmosphere shall be deemed a separate and distinct violation of this act.

SEC. 5. All acts or parts of acts in conflict herewith are hereby repealed.

SEC. 6. This act shall take effect immediately.

CALIFORNIA STATUTES.

LOCATION OF MINING CLAIMS, MILL SITES, AND ASSESSMENT WORK.

An act to amend the Civil Code of California by adding a new title thereto, to be numbered title X, in part IV of division second, consisting of sections 1426, 1426a, 1426b, 1426c, 1426d, 1426e, 1426f, 1426g, 1426h, 1426i, 1426j, 1426k, 1426l, 1426m, 1426n, 1426o, 1426p, 1426q, 1426r, and 1426s, providing for the manner of locating lode and placer mining claims, tunnel rights, mill sites, and prescribing the character and amount of assessment work on mining claims, and providing for proofs of such work, and for the recordation of location notices, and proof of labor, and for the enforcement of contributions from delinquent co-owners of mining claims, and prescribing the duties of county recorders respecting the recording of location notices of, and proofs of labor on, mining claims, tunnel rights, and mill sites, and the fees to be charged therefor, and repealing acts in conflict herewith.

[Approved March 13, 1909.]

The people of the state of California, represented in senate and assembly, do enact as follows:

SECTION 1. The Civil Code of the state of California is hereby amended by adding a new title thereto, to be numbered title X, in part IV of second division, consisting of sections 1426, 1426*a*, 1426*b*, 1426*c*, 1426*d*, 1426*e*, 1426*f*, 1426*g*, 1426*h*, 1426*i*, 1426*j*, 1426*k*, 1426*l*, 1426*m*, 1426*n*, 1426o, 1426*p*, 1426*q*, 1426*r*, and 1426*s*, to read as follows:

§ 1426. Any person, a citizen of the United States, or who has declared his intention to become such, who discovers a vein or lode of quartz, or other rock in place bearing gold, silver, cinnabar, lead, tin, copper, or other valuable deposit, may locate a claim upon such vein or lode, by defining the boundaries of the claim, in the manner hereinafter described, and by posting a notice of such location, at the point of discovery, which notice must contain:

First—The name of the lode or claim.

Second—The name of the locator or locators.

Third—The number of linear feet claimed in length along the course of the vein, each way from the point of discovery, with the width on each side of the center of the claim, and the general course of the vein or lode, as near as may be.

Fourth—The date of location.

Fifth—Such a description of the claim by reference to some natural object, or permanent monument, as will identify the claim located.

§ 1426*a*. The locator must define the boundaries of his claim so that they may be readily traced, and in no case shall the claim extend more than fifteen hundred feet along the course of the vein or lode, nor more than three hundred feet on either side thereof, measured from the center line of the vein at the surface.

§ 1426*b*. Within thirty days after the posting of his notice of location upon a lode mining claim, the locator shall record a true copy thereof in the office of the county recorder of the county in which such claim is situated, for which service the county recorder shall receive a fee of one dollar.

§ 1426*c*. The location of a placer claim shall be made in the following manner: By posting thereon, upon a tree, rock in place, stone, post or monument, a notice of location, containing the name of the claim, name of locator or locators, date of location, number of feet or acreage claimed, such a description of the claim by reference to some natural object or permanent monument as will identify the claim located, and by marking the boundaries so that they may be readily traced; *provided*, that where the United States survey has been extended over the land embraced in the location, the claim may be taken by legal subdivisions and no other reference than those of said survey shall be required and the boundaries of a claim so located and

described need not be staked or monumented. The description by legal subdivisions shall be deemed the equivalent of marking.

§ 1426*d*. Within thirty days after the posting of the notice of location of a placer claim, the locator shall record a true copy thereof in the office of the county recorder of the county in which such claim is situated, for which service the recorder shall receive a fee of one dollar.

§ 1426*e*. The locator of a tunnel right or location, shall locate his tunnel right or location by posting a notice of location at the face or point of commencement of the tunnel, which must contain:

First—The name of the locator or locators.

Second—The date of the location.

Third—The proposed course or direction of the tunnel.

Fourth—A description of the tunnel, with reference to some natural object or permanent monument as shall identify the claim or tunnel right.

§ 1426*f*. The boundary lines of the tunnel shall be established by stakes or monuments placed along the lines at an interval of not more than six hundred feet from the face or point of commencement of the tunnel to the terminus of three thousand feet therefrom.

§ 1426*g*. Within thirty days after the posting of the notice of location of the tunnel right or location, the locator shall record a true copy thereof, in the office of the county recorder of the county in which such claim is situated, for which service the recorder shall receive a fee of one dollar.

§ 1426*h*. If at any time the locator of any mining claim heretofore or hereafter located, or his assigns, shall apprehend that his original location notice was defective, erroneous, or that the requirements of the law had not been complied with before filing; or in case the original notice was made prior to the passage of this act, and he shall be desirous of securing the benefit of this act, such locator, or his assigns, may file an additional notice, subject to the provisions of this act; *provided*, that such amended location notice does not interfere with the existing rights of others at the time of posting and filing such amended location notice, and no such amended location notice or the record thereof, shall preclude the claimant, or claimants from proving any such title as he or they may have held under previous locations.

§ 1426*i*. Where a locator, or his assigns, has the boundaries and corners of his claim established by a United States deputy mineral survey, or a licensed surveyor of this state, and his claim connected with the corner of the public or minor surveys of an established initial point, and incorporates into the record of the claim, the field notes of such survey, and attaches to and files with such location notice a certificate of the surveyor, setting forth: *first*, that said survey was actually made by him, giving the date thereof; *second*, the name of the claim surveyed and the location thereof; *third*, that the description incorporated in the declaratory statement is sufficient to identify; such survey and certificate becomes a part of the record, and such record is prima facie evidence of the facts therein contained.

§ 1426*j*. The proprietor of a vein or lode claim or mine, or the owner of a quartz mill or reduction works, or any person qualified by the laws of the United States, may locate not more than five acres of non-mineral land as a mill site. Such location shall be made in the same manner as hereinbefore required for locating placer claims.

§ 1426*k*. The locator of a mill site claim or location shall, within thirty days from the date of his location, record a true copy of his location notice with the county recorder of the county in which such location is situated, for which service the recorder shall receive a fee of one dollar.

§ 1426*l*. The amount of work done or improvements made during each year to hold possession of a mining claim shall be that prescribed by the laws of the United States, to wit: One hundred dollars annually.

§ 1426*m*. Whenever [a] mine owner, company, or corporation shall have performed the labor and made the improvements required by law upon any mining claim, the person in whose behalf such labor was performed or improvements made, or some one in his behalf, shall within thirty days after the time limited for performing

such labor or making such improvements make and have recorded by the county recorder, in books kept for that purpose, in the county in which such mining claim is situated, an affidavit setting forth the value of labor or improvements made, the name of the claim, and the name of the owner or claimant of said claim at whose expense the same was made or performed. Such affidavit, or a copy thereof, duly certified by the county recorder, shall be prima facie evidence of the performance of such labor or the making of such improvements, or both.

§ 1426*n*. For recording the affidavit herein required, the county recorder shall receive a fee of fifty cents.

§ 1426*o*. Whenever a co-owner or co-owners of a mining claim shall give to a delinquent co-owner or co-owners the notice in writing or notice by publication provided for in section 2324, Revised Statutes of the United States, an affidavit of the person giving such notice, stating the time, place, manner of service, and by whom and upon whom such service was made, shall be attached to a true copy of such notice, and such notice and affidavit must be recorded in the office of the county recorder, in books kept for that purpose, in the county in which the claim is situated, within ninety days, after the giving of such notice; for the recording of which said recorder shall receive the same fees as are now allowed by law for recording deeds; or if such notice is given by publication in a newspaper, there shall be attached to a printed copy of such notice an affidavit of the printer or his foreman, or principal clerk of such paper, stating the date of the first, last and each insertion of such notice therein, and where the newspaper was published during that time, and the name of such newspaper. Such affidavit and notice shall be recorded as aforesaid, within one hundred and eighty days after the first publication thereof. The original of such notice and affidavit, or a duly certified copy of the record thereof, shall be prima facie evidence that the delinquent mentioned in section 2324 has failed or refused to contribute his proportion of the expenditure required by that section, and of the service of publication of said notice; *provided*, the writing or affidavit hereinafter provided for is not of record. If such delinquent shall, within the ninety days required by section 2324, aforesaid, contribute to his co-owner or co-owners, his proportion of such expenditures, and also all costs of service of the notice required by this section, whether incurred for publication charges, or otherwise, such co-owner or co-owners shall sign and deliver to the delinquent or delinquents a writing stating that the delinquent or delinquents by name has within the time required by section 2324 aforesaid, contributed his share for the year _____, upon the _____ mine, and further stating therein the district, county and state wherein the same is situated, and the book and page where the location notice is recorded, if said mine was located under the provisions of this act; such writing shall be recorded in the office of the county recorder of said county, for which he shall receive the same fees as are now allowed by law for recording deeds. If such co-owner or co-owners shall fail to sign and deliver such writing to the delinquent or delinquents within twenty days after such contribution, the co-owner or co-owners so failing as aforesaid shall be liable to the penalty of one hundred dollars, to be recovered by any person for the use of the delinquent or delinquents in any court of competent jurisdiction. If such co-owner or co-owners fail to deliver such writing within said twenty days, the delinquent, with two disinterested persons having personal knowledge of such contribution, may make affidavit setting forth in what manner, the amount of, to whom, and upon what mine, such contribution was made. Such affidavit, or a record thereof, in the office of the county recorder of the county in which such mine is situated, shall be prima facie evidence of such contribution.

§ 1426*p*. The record of any location of a mining claim, mill site or tunnel right, in the office of the county recorder, as herein provided shall be received in evidence, and have the same force and effect in the courts of the state as the original notice.

§ 1426*q*. Copies of the records of all instruments required to be recorded by the provisions of this act, duly certified by the recorder, in whose custody such records are, may be read in evidence, under the same circumstances and rules as are now, or may be hereafter provided by law, for using copies of instruments relating to real estate, duly executed or acknowledged or proved and recorded.

§ 1426*r*. The provisions of this act shall not in any manner be construed as affecting or abolishing any mining district or the rules and regulations thereof within the state of California.

§ 1426*s*. The failure or neglect of any locator of a mining claim to perform development work of the character, in the manner and within the time required by the laws of the United States, shall disqualify such locators from relocating the ground embraced in the original location or mining claim or any part thereof under the mining laws, within three years after the date of his original location and any attempted relocation thereof by any of the original locators shall render such location void.

SEC. 2. All acts and parts of acts in conflict with this act, are hereby repealed.

SEC. 3. This act shall take effect and be in force on and after July 1, 1909.

STATE SCHOOL LANDS.

Act 2227 (General Laws). This act provides that public lands of California, Secs. 16 and 36, are open to mineral entry under the usual mining law provisions.

MINING CORPORATIONS.

An act to repeal Title XI of Part IV of Division First of the Civil Code and each and every section of said title, and to substitute a new Title XI to take the place thereof in said code, relating to mining corporations.

[Approved March 21, 1905.]

The people of the state of California, represented in senate and assembly, do enact as follows:

SECTION 1. Title XI and Part IV of Division First of the Civil Code and each and every section of said title are hereby repealed, and a new Title XI is substituted in place thereof in said code, to read as follows:

TITLE XI.

MINING CORPORATIONS.

SEC. 586. Transfer agencies.
587. Stock issued at transfer agencies.
587*a*. Consolidation of mining corporations.
588. Books and balance sheets to be kept by secretary. Stockholders' right to inspect.
589. Right of stockholders to visit mine with expert.
590. Liability of presidents and directors.

§ 586. Any corporation organized in this state for the purpose of mining or carrying on mining operations in or without this state, may establish and maintain agencies in other states of the United States, for the transfer and issuing of their stock; and a transfer or issue of the same at any such transfer agency, in accordance with the provisions of its by-laws, is valid and binding as fully and effectually for all purposes as if made upon the books of such corporation at its principal office within this state. The agencies must be governed by the by-laws and the directors of the corporation.

§ 587. All stock of any such corporation, issued at a transfer agency, must be signed by the president and secretary of the corporation, and countersigned at the time of its issue by the agent having charge of the transfer agency. No stock must be issued at a transfer agency unless the certificate of stock, in lieu of which the same is issued, is at the time surrendered for cancellation.

§ 587*a*. It is lawful for two or more corporations formed, or that may hereafter be formed, under the laws of this state, for mining purposes, which own or possess mining claims or lands adjoining each other, or lying in the same vicinity, to consolidate their capital stock, debts, property, assets and franchises, in such manner

and upon such terms as may be agreed upon by the respective boards of directors or trustees of such corporations so desiring to consolidate their interests; but no such consolidation must take place without the written consent of the stockholders representing two-thirds of the capital stock of each corporation, and no such consolidation can, in any way, relieve such corporations, or the stockholders thereof, from any and all just liabilities; and in case of such consolidation, due notice of the same must be given, by advertising, for one month, in at least one newspaper in the county where the said mining property is situated, if there is one published therein, and also in one newspaper published in the county where the principal place of business of any of said corporation is. And when the consolidation is completed, a certificate thereof, containing the manner and terms of such consolidation, must be filed in the office of the county clerk of the county in which the original certificate of incorporation of each of said corporations is filed, and a copy thereof must be filed in the office of the secretary of state; such certificate must be signed by a majority of each board of trustees or directors of the original corporations, and it is their duty to call, within thirty days after the filing of such certificate, a meeting of the stockholders of all of said corporations so consolidated, to elect a board of trustees or directors for the consolidated corporation, for the year thence next ensuing; and to cause notice of the time and place fixed for such meeting to be mailed to each stockholder of each of such corporations at his last known place of residence or business at least ten days before the time fixed for such meeting. The said certificate must also contain all the requirements prescribed by section two hundred and ninety.

§ 588. It is the duty of the secretary of every corporation formed for the purpose of mining, or conducting mining in California, whether such corporation be formed and organized under the laws of the state of California or of any other state, territory, or foreign country, to keep at some place within the state of California an office and in such office to keep a complete set of books showing all receipts and expenditures of such corporation, the sources of such receipts, and the objects of such expenditures, and also all transfers of stock. All books and papers must, at all times during business hours, be open to the inspection of any stockholder. He is entitled to be accompanied by an expert, and to make copies or extracts from any such books or papers. He may, at reasonable hours, examine such mining property, accompanied by an expert, take samples, and make such other examination as he may deem necessary. It is the duty of the directors, on the second Monday of each and every month, to cause to be made an itemized account or balance sheet for the previous month, embracing a full and complete statement of all disbursements and receipts, showing from what sources such receipts were derived, and to whom and for what object or purpose such disbursements or payments were made; also all indebtedness or liabilities incurred or existing at the time, and for what the same were incurred, and the balance of money, if any, on hand. Such account or balance sheet must be verified under oath by the president and secretary, and posted in some conspicuous place in the office of the company. It is the duty of the superintendent, on the first Monday of each month, to file with the secretary an itemized account, verified under oath, showing all receipts and disbursements made by him for the previous month, and for what said disbursements were made. Such account must also contain a verified statement showing the number of men employed under him, and for what purpose, and the rate of wages paid to each. He must attach to such account a full and complete report, under oath, of the work done in said mine, the amount of ore extracted, from what part of mine taken, the amount sent to mill for reduction, its assay value, the amount of bullion received, the amount of bullion shipped to the office of the company or elsewhere, and the amount, if any, retained by the superintendent. It is his duty to forward to the office of the company a full report, under oath, of all discoveries of ores or mineral-bearing quartz made in said mine, whether by boring, drifting, sinking, or otherwise, together with the assay value thereof. All accounts, reports, and correspondence from the superintendent must be kept in some conspicuous place in the office of said company, open to the inspection of all stockholders.

§ 589. Any stockholder of a corporation formed under the laws of this state for the purpose of mining, is entitled to visit, accompanied by his expert, and examine the mine or mines owned by such corporation, and every part thereof, at any time he may see fit; and when such stockholder applies to the president of such corporation, he must immediately cause the secretary thereof to issue and deliver to such applicant an order, under the seal of the corporation, directed to the superintendent, commanding him to show and exhibit such parts of said mine or mines as the party named in said order may desire to visit and examine. It is the duty of the superintendent, on receiving such order, to furnish such stockholder every facility for making a full and complete inspection of said mine or mines, and of the workings therein, and to accompany said stockholder either in person, or to furnish some person familiar with said mine or mines to accompany him in his visit to and through such mine or mines, and every part thereof. If the superintendent fails to obey such order, such stockholder is entitled to recover, in any court of competent jurisdiction, against the corporation, the sum of one thousand dollars, and traveling expenses to and from the mine, as liquidated damages, together with costs of suit. In case of such refusal, it is the duty of the directors of the corporation forthwith to remove the officer so refusing, and thereafter he must not be employed directly or indirectly by the corporation, nor must any salary be paid to him.

§ 590. In case of the refusal or neglect of the president to cause to be issued by the secretary the order mentioned in section five hundred and eighty-nine, such stockholder is entitled to recover against said president the sum of one thousand dollars and costs, as provided in the last section. If the directors fail to have the reports and accounts current made and posted as provided in section five hundred and eighty-eight, they are liable, either severally or jointly, to an action by any stockholder complaining thereof, and on proof of such refusal or failure, he may recover judgment for actual damages sustained by him, with costs of suit. Each of such defaulting directors is also liable to removal for such neglect.

CORPORATION LICENSE TAX LAW.

Chapter 190.

An act prescribing terms and conditions upon which corporations may transact business in this state and providing penalties and forfeitures for noncompliance.

[Approved May 10, 1915.]

The people of the state of California do enact as follows:

SECTION 1. Every corporation organized under the laws of another state, territory, or of a foreign country, which is now doing business in this state or maintaining an office herein, and which has not filed with the secretary of state prior to the day on which this act takes effect the document or documents required by section four hundred and eight of the Civil Code, or which shall hereafter do business in this state or maintain an office herein, or which shall enter this state for the purpose of doing business herein, must file in the office of the secretary of state of the state of California a certified copy of its articles of incorporation, or of its charter, or of the statute or statutes, or legislative, or executive, or governmental act or acts creating it, in cases where it has been created by charter, or statute, or legislative, or executive, or governmental act, duly certified by the secretary of state or other officer authorized by the law of the jurisdiction under which such corporation is formed to certify such copy, and must also file a certified copy thereof, duly certified by the secretary of state of this state in the office of the county clerk of the county where its principal place of business in this state is located, and also where such corporation owns any property, and every such corporation shall pay to the secretary of state for filing in his office such certified copy of its articles of incorporation, or of its charter, or of the statute or statutes, or

legislative, or executive, or governmental act or acts creating it, a fee of seventy-five dollars, which fee shall be in lieu of the filing fee provided for in section four hundred and nine of the Political Code; *provided*, that foreign corporations organized for educational, religious, scientific or charitable purposes and having no capital stock, shall pay a fee of five dollars for filing the document or documents hereinabove required.

Foreign corporations having a capital stock shall also file with the secretary of state copies of any documents showing an increase or decrease in their authorized capital stock, which documents shall be certified in the manner hereinabove required, but no fee shall be paid for such filing. It is hereby provided that every foreign corporation subject to the tax herein provided shall file with the secretary of state, at the time it tenders payment of said tax and any penalty which has accrued, an affidavit sworn to by its president or secretary, showing the amount of its authorized capital stock on the first day of January of the year in which said payment is made, and in the event that such authorized capital stock, as shown by such affidavit, differs from the amount of such capital stock as appears from the records of the secretary of state, then the tax herein provided shall be measured by the amount shown in such affidavit, but in such event the license herein required shall not be issued nor shall the amount so tendered be accepted until copies of any documents relating to such change in authorized capital stock, certified as required by this section, shall have been filed with the secretary of state. If such corporation shall neglect to file such copy or copies before the hour of six o'clock p.m. of the first Monday of February of the year for which the license must be procured, it shall suffer the penalty for the delinquency herein provided and if it shall neglect to make such filing before the hour of six o'clock p.m. of the Saturday preceding the first Monday in March of such year, it shall suffer the forfeiture provided in section seven of this act; *provided, however*, that any foreign corporation which, prior to the eighth day of March, nineteen hundred and one, shall have complied with the provisions of the act entitled, "An act to amend 'An act in relation to foreign corporations,' approved April first, eighteen hundred and seventy-two," approved March seventeenth, eighteen hundred and ninety-nine, shall, in lieu of the provisions of this section above set forth, file the affidavit herein required and the license tax due from such corporation shall be measured by the authorized capital stock, as shown thereby.

SEC. 2. Upon filing in the office of the secretary of state the certified copy of articles of incorporation of corporations organized under the laws of this state, there shall be paid to the secretary of state the fees prescribed therefor by section four hundred and nine of the Political Code.

SEC. 3. No corporation heretofore or hereafter incorporated under the laws of this state, or of any other state, territory, or foreign country, shall do or attempt to do any intrastate business within this state by virtue of its charter, or certificate of incorporation, without a state license therefor.

SEC. 4. It shall be the duty of every corporation incorporated under the laws of this state, and of every corporation incorporated under the laws of any other state, territory, or foreign country, now doing intrastate business within this state, or which shall hereafter engage in intrastate business in this state, to procure annually from the secretary of state a license authorizing the transaction of such business in this state, and to pay therefor the license tax prescribed herein.

For the purpose of measuring said tax the secretary of state shall examine all articles of incorporation and all documents on file in his office relating to an increase or decrease in the authorized capital stock of corporations which are subject to said tax, and determine the amount due from each corporation by the following rule:

When the authorized capital stock of the corporation does not exceed ten thousand dollars ($10,000.00) the tax shall be ten dollars ($10.00); when the authorized capital stock exceeds ten thousand dollars ($10,000.00) but does not exceed twenty thousand dollars ($20,000.00) the tax shall be fifteen dollars ($15.00); when the authorized capital stock exceeds twenty thousand dollars ($20,000.00) but does not exceed fifty thousand dollars ($50,000.00) the tax shall be twenty dollars

($20.00); when the authorized capital stock exceeds fifty thousand dollars ($50,000.00) but does not exceed one hundred thousand dollars ($100,000.00) the tax shall be twenty-five dollars ($25.00); when the authorized capital stock exceeds one hundred thousand dollars ($100,000.00) but does not exceed two hundred and fifty thousand dollars ($250,000.00) the tax shall be fifty dollars ($50.00); when the authorized capital stock exceeds two hundred and fifty thousand dollars ($250,000.00), but does not exceed five hundred thousand dollars ($500,000.00) the tax shall be seventy-five dollars ($75.00); when the authorized capital stock exceeds five hundred thousand dollars ($500,000.00) but does not exceed one million dollars ($1,000,000.00) the tax shall be one hundred dollars ($100.00); when the authorized capital stock exceeds one million dollars ($1,000,000.00) but does not exceed three million dollars ($3,000,000.00) the tax shall be two hundred dollars ($200.00); when the authorized capital stock exceeds three million dollars ($3,000,000.00) but does not exceed five million dollars ($5,000,000.00) the tax shall be three hundred and fifty dollars ($350.00); when the authorized capital stock exceeds five million dollars ($5,000,000.00) but does not exceed seven million five hundred thousand dollars ($7,500,000.00) the tax shall be five hundred fifty dollars ($550.00); when the authorized capital stock exceeds seven million five hundred thousand dollars ($7,500,000.00) but does not exceed ten million dollars ($10,000,000.00) the tax shall be eight hundred dollars ($800.00); when the authorized capital stock exceeds ten million dollars ($10,000,000.00) the tax shall be one thousand dollars ($1,000.00). All corporations having no capital stock, but organized for profit, shall pay an annual tax of ten dollars ($10.00). Said license tax shall be due and payable to the secretary of state on the first day of January of each and every year. Such license tax shall be paid on or before the hour of six o'clock p.m. of the first Monday of February of each year and if not so paid shall at said hour become delinquent and there shall thereupon be added thereto as a penalty for such delinquency the sum of ten dollars ($10.00).

SEC. 5. The license hereby provided authorizes the corporation holding the same to transact intrastate business in this state during the year or any fractional part of such year for which such license is issued. "Year," within the meaning of this act, means from and including the first day of January to and including the thirty-first day of December next thereafter.

SEC. 6. At the time of filing any certified copy of articles of incorporation, or charter, or statute or statutes, or legislative, or executive or governmental act or acts creating a corporation, when filed between the first day of January and the thirty-first day of December, inclusive, in any year, there shall be paid to the secretary of state, in addition to all other fees required by law, that proportion of the license tax specified in section four of this act which the unexpired number of months of such year bears to the entire year including the month in which such filing occurs, and thereupon the secretary of state shall issue a license for such fractional part of the then current year.

SEC. 7. At the hour of six o'clock p.m. of the Saturday preceding the first Monday in March of each year the charters of all corporations organized under the laws of this state and which have failed to pay the license tax and penalty prescribed by section four of this act shall be forfeited to the state of California, and the right of all foreign corporations to do intrastate business in this state, which have failed to pay said license tax and penalties shall be likewise forfeited.

SEC. 8. Educational, religious, scientific and charitable corporations, corporations which are not organized for profit, and corporations doing solely an interstate business and those corporations enumerated in subdivisions (*a*), (*b*) and (*c*) of section fourteen of article XIII of the constitution are exempt from the payment of the tax provided by this act.

SEC. 9. Any corporation claiming exemption from the payment of said annual license tax must file with the secretary of state at least sixty days before such tax becomes due and payable a written protest in which it shall set forth all facts and reasons upon which such exemption claim is made, sworn to by the president and secretary or general manager of such corporation. Failure to protest in the

manner and within the time herein prescribed shall constitute a waiver of all rights of exemption from said tax. Such corporation shall furnish under oath such other proof as the secretary of state may require or demand. All evidence and proofs submitted upon such claim of exemption shall be submitted by the secretary of state to the board of control and state controller, and said officers shall thereupon determine the question of such corporation's claim of exemption. The determination of said officers upon all questions of fact shall be final and conclusive; *provided, however*, that at the time of filing a certified copy of the articles of incorporation of any domestic corporation in the office of the secretary of state, and at the time a foreign corporation files with the secretary of state the document or documents required by section one of this act, the secretary of state shall determine whether such corporation is exempt as an educational, religious, scientific, or charitable corporation or as a non-profit corporation or as one of the corporations enumerated in subdivisions (*a*), (*b*) and (*c*) of section fourteen of article XIII of the constitution.

SEC. 10. If the license tax and penalties for delinquency required to be paid by section four of this act are not paid within the time herein required, the secretary of state shall on the Saturday preceding the first Monday in March, and at six o'clock p.m. of said day, enter upon the record of corporations in his office against the name of any company so failing to pay said license tax and penalty the words "charter forfeited to the state," if the corporation be a domestic corporation, and thereupon said charter shall be *ipso facto* so forfeited, and the words "right to do intrastate business forfeited" if the corporation be a foreign corporation, and thereupon said right to do intrastate business in this state shall be *ipso facto* so forfeited.

SEC. 11. On or before the first Monday of April of each year the secretary of state shall make a list of all domestic corporations whose charters have been so forfeited, and of all foreign corporations whose right to do intrastate business in this state has been so forfeited or which have surrendered their right to do intrastate business in this state as provided in section fifteen of this act, and shall transmit a certified copy thereof to each county clerk in this state, who shall file the same in his office.

SEC. 12. It shall be unlawful for any corporation, either domestic or foreign, which has not paid the license tax, as in this act prescribed, to exercise the powers of such corporation, or to transact any intrastate business in this state, after six o'clock p.m. of the Saturday preceding the first Monday in March next following the delinquency. Each and every person who exercises any of the powers of a corporation which has forfeited its charter or right to do intrastate business in this state, or who transacts any business for or in behalf of such corporation, after such forfeiture, shall be guilty of a misdemeanor, and upon conviction thereof shall be punished by a fine of not less than one hundred dollars and not exceeding one thousand dollars, or by imprisonment in the county jail not less than fifty days or more than five hundred days, or by both such fine and imprisonment.

SEC. 13. In all cases of forfeiture under the provisions of this act, the directors or managers in office of the affairs of any domestic corporation, whose charter may be so forfeited, or of any foreign corporation whose right to do business in this state may be so forfeited, are deemed to be trustees of the corporation and stockholders or members of the corporation whose power or right to do business is forfeited and have full power to settle the affairs of the corporation and to maintain or defend any action or proceeding then pending in behalf of or against any of said corporations, or to take such legal proceedings as may be necessary to fully settle the affairs of said corporation, and such directors or managers, as such trustees, may be sued in any of the courts of this state by any person having a claim against any of said corporations; *provided, always*, that no action pending against any corporation shall abate thereby, but may be prosecuted to final judgment and may be enforced by execution with the same force and effect and in like manner as though no forfeiture had occurred; *and provided, further*, that where judgment has been entered against any corporation prior to forfeiture under this act, that notwithstanding, execution may be issued thereon and the property of said corporation, or that may come into the hands of any trustees for it may be levied upon, seized and sold to satisfy the same with like force and effect as though such forfeiture had not occurred.

SEC. 14. Any domestic corporation which suffers the forfeiture prescribed by this act, may pay to the secretary of state all taxes and penalties which shall have accrued prior to such forfeiture, and all taxes and penalties which would have accrued if such forfeiture had not occurred; and shall file an application with the secretary of state for the restoration of its charter, which application must set forth the names of the persons who became trustees upon such forfeiture, under the provisions of section thirteen of this act, and shall be signed by all of said persons then surviving, and acknowledged by each of said persons before an officer authorized by the laws of this state to take acknowledgments of conveyances of real property; whereupon such corporation shall be restored to its former corporate status and the secretary of state shall issue to such corporation a license entitling it to transact intrastate business in this state during the year in which such license is issued; *provided, however,* that no corporation organized under the laws of this state which suffers such forfeiture shall be relieved from the effect thereof, nor shall such license be issued, in the event that subsequent to the date of forfeiture its corporate name, or a name so closely resembling said name as will tend to deceive, has been adopted and is in use by another domestic corporation.

Any foreign corporation which suffers a forfeiture of its right to do intrastate business in this state, may pay to the secretary of state all taxes and penalties which shall have accrued prior to such forfeiture, and all taxes and penalties which would have accrued if such forfeiture had not occurred, and shall file with the secretary of state its application for a restoration of its right to do intrastate business, and copies of any documents increasing or decreasing its capital stock, certified as hereinbefore provided, together with an affidavit by its president or secretary, setting forth the amount of its authorized capital stock on the first day of January of the year in which said application is presented, and the taxes which would have accrued after the date of such forfeiture shall be measured by the authorized capital stock, as shown by such copies and affidavits; whereupon such corporation shall be restored to its former corporate status and the secretary of state shall issue to such corporation a license entitling it to do intrastate business in this state during the year in which such license is issued.

Any domestic corporation which has heretofore suffered a forfeiture of its charter under the provisions of an act entitled "An act relating to revenue and taxation, providing for a license tax upon corporations and making an appropriation for the purpose of carrying out the objects of this act." approved March 20, 1905, or under the provisions of any act amendatory thereof, may be restored to its former corporate status, subject to and upon complying with the conditions hereinabove provided for the reinstatement of domestic corporations which suffer the forfeiture prescribed by this act, and in addition thereto, upon payment of the taxes and penalties which would have accrued under said act of 1905, or any of the acts amendatory thereof, if such forfeiture had not occurred.

Any foreign corporation which has suffered a forfeiture of its right to do business in this state under the provisions of said act of 1905, or any act amendatory thereof, may be relieved from the effect thereof and resume an intrastate business in this state upon filing with the secretary of state an affidavit by its president or secretary, setting forth the amount of its capital stock at time of taking effect of this act, and stating any subsequent changes in said authorized capital stock, and the dates on which such changes became effective, and shall pay to the secretary of state all taxes and penalties which would have accrued under said act of 1905, or under any of the acts amendatory thereof if such forfeiture had not occurred, and the taxes and penalties which would have accrued under the provisions of this act; whereupon such corporation shall be restored to its former corporate status and the secretary of state shall issue to such corporation a license entitling it to do intrastate business in this state during the year for which the license is issued. And the secretary of state shall, on or before the first Monday of April of each year, make a list of the corporations, both foreign and domestic, so paying, and of the foreign corporations which have resumed the transaction of intrastate business in this state, as provided in section fifteen of this act, and shall transmit a certified copy of said list to each

county clerk in this state, who shall file the same in his office; *provided*, the rehabilitation of any such corporation by reason of making such payments shall be without prejudice to any action, defense, or right which accrued by reason of the original forfeiture.

SEC. 15. Any foreign corporation may surrender its right to engage in intrastate business in this state by filing a stipulation with the secretary of state, in which it shall agree that it will not transact such business at any time thereafter without first obtaining from the secretary of state a license authorizing the resumption of such business, as hereinafter provided. Upon the filing of such stipulation and upon the payment of any tax or penalty then due, said corporation shall be exempt from the payment of the tax provided in this act. It shall be unlawful for any such corporation to exercise its corporate powers in transacting any intrastate business in this state after the filing of such stipulation. Each and every person who exercises any of the powers of such corporation in the transaction of intrastate business or who transacts any intrastate business for or in behalf of such corporation after such filing shall be subject to penalties prescribed by section twelve of this act.

Any such corporation may resume the transaction of intrastate business in this state at any time thereafter upon filing its application for a license therefor with the secretary of state and an affidavit by its president or secretary setting forth the amount of its authorized capital stock, and copies of any documents increasing or diminishing such capital stock, which copies shall be certified as herein provided, and upon paying a tax for the unexpired portion of the year which shall be measured by its authorized capital stock and which shall be that portion of the license tax specified in section four of this act which the unexpired number of months of such year, including the month in which such license is issued, bears to the entire year.

SEC. 16. Any false statement contained in any of the affidavits herein required shall constitute perjury, and shall be punishable as such.

SEC. 17. All moneys herein required to be paid shall, upon collection by the secretary of state, be immediately paid by him into the state treasury.

SEC. 18. Nothing in this act shall be construed as affecting or repealing any statute of this state respecting the assessment of franchises and levying of taxes thereon.

SEC. 19. The provisions of this act in so far as they relate to the payment of the license tax provided for in section four of this act shall take effect on the first day of January, 1916, and as to all other provisions this act shall take effect ninety days after final adjournment of the forty-first session of the legislature.

PROTECTION OF STOCKHOLDERS.

An act to amend an act entitled "An act to protect stockholders and persons dealing with corporations in this state," approved March 29, 1878, and all acts amendatory thereof, and to repeal all laws in conflict therewith.

[Approved March 22, 1905.]

The people of the state of California, represented in senate and assembly, do enact as follows:

SECTION 1. Any superintendent, director, secretary, manager, agent, or other officer, of any corporation formed or existing under the laws of this state, or transacting business in the same, and any person pretending or holding himself out as such superintendent, director, secretary, manager, agent, or other officer, who shall wilfully subscribe, sign, endorse, verify, or otherwise assent to the publication, either generally or privately, to the stockholders or other persons dealing with such corporation, or its stock, any untrue or wilfully and fraudulently exaggerated report,

prospectus, account, statement of operations, values, business, profits, expenditures or prospects, or other paper or document intended to produce or give, or having a tendency to produce or give, to the shares of stock in such corporation a greater value or less apparent or market value than they really possess, or with the intention of defrauding any particular person or persons, or the public, or persons generally, shall be deemed guilty of a felony, and on conviction thereof shall be punished by imprisonment in state prison or a county jail not exceeding two years, or by fine not exceeding five thousand dollars, or by both.

SEC. 2. All acts and parts of acts in conflict with this act are hereby repealed.

CIVIL CODE.

§ 309 The directors of corporations must not make dividends, except from the surplus profits arising from the business thereof; nor must they create any debts beyond their subscribed capital stock; nor must they divide, withdraw or pay to the stockholders, or any of them, any part of the capital stock, except as hereinafter provided, nor reduce or increase the capital stock, except as herein specially provided. For a violation of the provisions of this section, the directors under whose administration the same may have happened (except those who may have caused their dissent therefrom to be entered at large on the minutes of the directors at the time, or were not present when the same did happen) are, in their individual or private capacity, jointly and severally liable to the corporation, and to the creditors thereof, to the full amount of the capital stock so divided, withdrawn, paid out, or reduced, or debt contracted; and no statute of limitation is a bar to any suit against such directors for any sums for which they are liable by this section; *provided, however,* that where a corporation has been heretofore or may hereafter be formed for the purpose, among other things, of acquiring, holding, and selling real estate, water, and water rights, the directors of such corporation may, with the consent of stockholders representing two-thirds of the capital stock thereof, given at a meeting called for that purpose, divide among the stockholders the land, water or water rights so by such corporation held, in the proportions to which their holdings of such stock at the time of such division entitled them. All conveyances made by the corporation in pursuance of this section must be made and received subject to the debts of such corporation existing at the date of the conveyance thereof. Nothing herein prohibits a division and distribution of the capital stock of any corporation which remains after the payment of all its debts, upon its dissolution, or the expiration of its term of existence.

PENAL CODE.

§ 560. Every director of any stock corporation who concurs in any vote or act of the directors of such corporation or any of them, by which it is intended, either—

1. To make any dividend, except from the surplus profits arising from the business of the corporation, and in the cases and manner allowed by law; or,

2. To provide, withdraw, or in any manner, except as provided by law, pay to the stockholders, or any of them, any part of the capital stock of the corporation; or,

3. To discount or receive any note or other evidence of debt in payment of any installment actually called in and required to be paid, or with the intent to provide the means of making such payment; or,

4. To receive or discount any note or other evidence of debt, with the intent to enable any stockholder to withdraw any part of the money paid in by him, or his stock; or,

5. To receive from any other stock corporation, in exchange for the shares, notes, bonds, or other evidences of debt of their own corporation, shares of the capital stock of such other corporations, or notes, bonds, or other evidence of debt issued by such other corporation—is guilty of a misdemeanor.

THE RIGHT OF EMINENT DOMAIN.

An act to amend section twelve hundred and thirty-eight of the Code of Civil Procedure, relating to the purposes for which the right of eminent domain may be exercised, and repealing all acts and parts of acts in conflict with this act.

[Approved April 28, 1911.]

SECTION 1. Section twelve hundred and thirty-eight of the Code of Civil Procedure is hereby amended to read as follows:

§ 1238. Subject to the provisions of this title, the right of eminent domain may be exercised in behalf of the following public uses:

4. Wharves, docks, piers, chutes, booms, ferries, bridges, toll roads, by-roads, plank, and turnpike roads; paths and roads either on the surface, elevated, or depressed, for the use of bicycles, tricycles, motor cycles and other horseless vehicles, steam, electric, and horse railroads, canals, ditches, dams, poundings, flumes, aqueducts and pipes for irrigation, public transportation, supplying mines and farming neighborhoods with water, and draining and reclaiming lands, and for floating logs and lumber on streams not navigable.

5. Roads, tunnels, ditches, flumes, pipes and dumping places for working mines; also outlets, natural or otherwise, for the flow, deposit, or conduct of tailings or refuse matter from mines; also an occupancy in common by the owners or possessors of different mines of any place for the flow, deposit, or conduct of tailings or refuse matter from their several mines.

6. By-roads leading from highways to residences, farms, mines, mills, factories and buildings for operating machinery, or necessary to reach any property used for public purposes.

7. Telegraph and telephone lines, systems and plants.

9. Roads for transportation by traction engines or road locomotives.

10. Oil pipe lines.

11. Roads and flumes for logging or lumbering purposes.

12. Canals, reservoirs, dams, ditches, flumes, aqueducts and pipes and outlets natural or otherwise for supplying, storing and discharging water for the operation of machinery for the purpose of generating and transmitting electricity for the supply of mines, quarries, railroads, tramways, mills, and factories with electric power; and also for the applying of electricity to light or heat mines, quarries, mills, factories, incorporated cities and counties, villages or towns; and also for furnishing electricity for lighting, heating or power purposes to individuals or corporations, together with lands, buildings and all other improvements in or upon which to erect, install, place, use or operate machinery for the purpose of generating and transmitting electricity for any of the purposes or uses above set forth.

SEC. 2. All acts and parts of acts in conflict with this act are hereby repealed.

SEC. 3. This act shall take effect immediately.

An act to amend section 1239 of the Code of Civil Procedure, relating to proceedings to exercise the right of eminent domain.

[Approved April 5, 1911.]

SECTION 1. Section 1239 of the Code of Civil Procedure of the state of California, is hereby amended to read as follows:

§ 1239. The following is a classification of the estates and rights in lands subject to be taken for public use:

1. A fee simple, when taken for public buildings or grounds, or for permanent buildings, for reservoirs and dams, and permanent flooding occasioned thereby, or for an outlet for a flow, or a place for the deposit of debris or tailings of a mine.

* * *

USE OF CALIFORNIA MATERIALS IN CALIFORNIA PUBLIC BUILDINGS.

Section 3247 of the Political Code.

"Any person, committee, board, officer, or any other person charged with the purchase, or permitted or authorized to purchase, supplies, goods, wares, merchandise, manufactures, or produce, for the use of the state, or any of its institutions or offices, or for the use of any county or consolidated city and county, or city, or town, shall always, price, fitness and quality being equal, prefer such supplies, goods, wares, merchandise, manufactures, or produce as has been grown, manufactured or produced in this state, and shall next prefer such as have been partially so manufactured, grown or produced in this state. All state, county, city and county, city or town officers, all boards, commissions, or other persons charged with advertising for any such supplies, shall state in their advertisement that such preferences will be made. In any such advertisement no bid shall be asked for any article of a specific brand or mark nor any patent apparatus or appliances, when such requirement would prevent proper competition on the part of dealers in other articles of equal value, utility or merit."

LANDS UNCOVERED BY RECESSION OF WATER.

An act to amend section 3493m of the Political Code, relating to land uncovered by the recession or drainage of the waters of inland lakes.

[Approved April 14, 1911.]

The people of the state of California, represented in senate and assembly, do enact as follows:

SECTION 1. Section 3493*m* of the Political Code is hereby amended to read as follows:

Section 3493*m*. Any person desiring to purchase any of the lands now uncovered or which may hereafter be uncovered by the recession or drainage of the waters of inland lakes, and inuring to the state by virtue of her sovereignty, or the swamp and overflowed lands not segregated by the United States, must make an application therefor to the surveyor general of the state, which application must be accompanied by the applicant's affidavit that he is a citizen of the United States, or has declared his intention to become such, a resident of this state, of lawful age, that he desires to purchase such lands (describing them by legal subdivisions, or by metes and bounds, if the legal subdivisions are unknown), under the provisions of this article, for his own use and benefit, and for the use and benefit of no other person whomsoever, and that he has made no contract or agreement to sell the same, and that he does not own any state lands which, together with that now sought to be purchased, exceeds six hundred and forty acres.

The provisions of this section shall not affect or apply to any land uncovered by the recession or drainage of the waters of any lake or other body of water, the waters of which are so impregnated with minerals as to be valuable for the purpose of extracting therefrom such minerals; but the land uncovered by the recession or drainage of such waters shall be subject to lease for periods of not longer than twenty-five years upon such charges, terms and conditions as may be prescribed by law.

SEC. 2. All acts or parts of acts in conflict herewith are hereby repealed.

SEC. 3. This act shall take effect immediately.

EXTRACTION OF MINERALS FROM WATER.

An act regulating the extraction of minerals from the waters of any stream or lake and prohibiting the extraction of minerals from said waters except under lease from or express permission of the state for a period not exceeding twenty-five years.

[Approved April 14, 1911.]

The people of the state of California, represented in senate and assembly, do enact as follows:

SECTION 1. Minerals contained in the waters of any stream or lake in this state shall not be extracted from said waters except upon charges, terms and conditions prescribed by law. No person, firm, corporation or association shall hereafter gain the right to extract or cause to be extracted said minerals from said waters by user, custom, prescription, appropriation, littoral rights, riparian rights, or in any manner other than by lease from or express permission of the state as prescribed by law; and no such lease or permission shall be granted for a longer period than twenty-five years.

SEC. 2. All acts or parts of acts in conflict herewith are hereby repealed.

SEC. 3. This act shall take effect immediately.

MINERAL LANDS WITHIN MEANDER LINES OF LAKES AND STREAMS.

An act relating to lakes and streams, the waters of which contain minerals in commercial quantities; withdrawing state lands within the meander lines thereof from sale; prescribing conditions for taking such minerals from said waters and lands, and providing for the leasing of lands uncovered by the recession of the waters of such lakes and streams.

[Approved April 27, 1911.]

The people of the state of California, represented in senate and assembly, do enact as follows:

SECTION 1. There is hereby withdrawn from selection and sale all of the lands embraced within the original meander lines of streams and lakes belonging to the state, the waters of which contain minerals in commercial quantities, and all such lands which may hereafter inure to the state by virtue of its sovereignty, excepting such lands now contracted to be sold under sections 3493*m* to 3493*t*, both inclusive, of the Political Code.

SEC. 2. No person, firm or corporation shall take water from such streams or lakes containing minerals and extract from such water such minerals, except under the terms and conditions of this act; and no person, firm or corporation may lease any land herein referred to and extract therefrom minerals deposited therein or thereon, except under the terms and conditions of this act.

SEC. 3. Every person, firm or corporation taking from the waters of such streams, lakes or lands any minerals, shall file, on or before the last Monday in January of each year, with the county assessor of the county in which any such stream or lake is situated, and also with the state controller, a written statement, duly verified, showing in tons of two thousand pounds, the amount of mineral taken by such person, firm or corporation from such water or land during the year ending December 31st last preceding, and sold by said person, firm or corporation during the said year preceding. Any such person, firm or corporation neglecting or refusing to furnish such statement shall be subject to a fine of one hundred dollars for each day after the said last Monday in January such person, firm or corporation, shall fail to furnish such statement, and, in addition to said fine, shall forfeit all leases granting the right to extract such minerals from said water and said land. Any person who shall,

either on behalf of himself or any firm or corporation, verify any such statement which shall be untrue in any material part, shall be deemed guilty of a misdemeanor.

SEC. 4. In case either the assessor or the state controller shall not be satisfie with the statement as returned, he may make an examination of the matters neces sary to verify or correct said statement, and, for that purpose, may subpœna witnesses and call for and compel the production of necessary books and papers belonging to the person, firm or corporation making the returns.

SEC. 5. The county assessor of the county shall, after examination and approval by him and the state controller of such statement, proceed to collect from such person, firm or corporation a royalty of twenty-five cents for each ton of two thousand pounds of mineral taken from such water or land by such person, firm or corporation and sold, during the preceding year, in the manner provided for the collection of personal property taxes; *provided*, that the royalty on sodium bicarbonate and on sodium hydrate so taken shall be fifty (50) cents for each ton of two thousand pounds.

SEC. 6. Any person, firm or corporation desiring to lease any lands under this act must make application therefor to the surveyor general of the state, describing the lands sought to be leased by legal subdivisions, or if the legal subdivisions are unknown to the applicant by metes and bounds. The application must be accompanied by a filing fee of ten dollars.

SEC. 7. Upon the receipt of such application, the surveyor general shall direct the county surveyor of the county in which such lands are situated to survey the land sought to be leased. The county surveyor shall make an actual survey of the land, at the expense of the applicant, establishing the four corners to each quarter section, and connecting the same with a United States survey; and, within thirty days file with the surveyor general a copy, under oath, of his field notes and plat. If the county surveyor fails to make the survey as herein provided, the surveyor general shall immediately direct another person to make the survey at the expense of the applicant, and said survey shall be made and completed within thirty days after the authorization, and the field notes and plats, or copies thereof, shall be sworn to by the surveyor making them and shall be filed with the surveyor general.

SEC. 8. All applications to lease land under this act shall be approved or rejected by the surveyor general within ninety days after the receipt thereof. Immediately after the approval of the application, the surveyor general shall execute and deliver to the applicant a lease of the lands described in the application.

SEC. 9. The lands designated in this act shall be leased at the rate of two dollars and fifty cents per acre, per year, payable yearly in advance. All moneys received as rental for such lands and as royalty upon the mineral product of the waters of the lakes, streams or lands above mentioned, shall be paid into the state school land fund.

SEC. 10. Whenever any lease is delivered to the applicant by the surveyor general, the lessee shall within fifteen days thereafter, present said lease to the treasurer of the state of California, and make payment of the first annual rental. The treasurer shall receive the money and give a receipt therefor. All subsequent annual payments of rental must be paid to the state treasurer, in like manner, within fifteen days after they become due. In case payments are not made as herein provided, the lease and all rights thereunder shall cease and terminate. No lease shall run for more than twenty-five years; *provided*, that upon the expiration of any lease, such lease may be extended for a period of twenty-five years upon such terms and conditions as may then be prescribed by law.

SEC. 11. All leases made under the authority of this act shall contain a reservation to the state of a right to locate rights of way across such leased lands, subject only to the requirements that the rights of way shall be located in such manner as to cause the least injury to the leased lands across which the same may be located, and that any damage suffered by the lessee of such lands shall be compensated by the lessee of the lands for whose benefit the right of way is required; and every such lease shall be subject to, and shall contain a reservation of, the right of any city and county or incorporated city or town of this state to at any time appropriate

and take, under the laws of this state relative to the appropriation of waters, water from any stream or lake tributary to or discharging into any stream or lake of the character mentioned in section one of this act, for any use or uses within the authorized powers of such city and county, or incorporated city or town.

SEC. 12. Leases of rights of way, not exceeding one hundred feet in width, for access to any water or lands designated by this act, may be applied for and granted in the manner herein provided for leasing lands. Such rights of way shall be leased at an annual rental of two dollars and fifty cents an acre, and the same shall be paid as herein provided for leased lands.

SEC. 13. All leases of mineral lands provided for by this act shall cease and terminate on December 31st of any year if the lessee or assigns has not, during the year preceding, extracted or removed from such land and water an amount of mineral equal, in the aggregate, to a minimum of five tons per acre of land leased; *provided*, that when a lease is not delivered to the lessee until after the fifteenth day of January of any year, the minimum tonnage for such year shall be less than five (5) tons, and shall be proportional to the number of days remaining in such year after the completion of the works.

SEC. 14. The surveyor general is hereby authorized to prepare, make, execute and deliver all papers, instruments and documents, and to do any and all things necessary to carry out the provisions of this act.

SEC. 15. The legislature shall have the right to change, from time to time, the royalty per ton of minerals extracted and the annual rental per acre of land, and such change shall apply to all persons, firms or corporations holding leases hereinunder; *provided*, that no lease given under this act shall be subject to any change, as to the royalty or rental provided for in said lease, subsequent to the execution of such lease until after ten years from the passage of this act.

SEC. 16. Any lessee hereinunder may abandon and surrender a lease at the expiration of any calendar year by filing with the county assessor of the county in which is situated the lands described in said lease, and with the surveyor general and the state controller, notices of said abandonment or surrender; but said notices must be filed at least sixty days before the expiration of said calendar year; and said abandonment and surrender shall not absolve the said lessee from the payment of any royalty which may be due at the end of said fiscal year, for minerals extracted from the waters or lands in this act specified.

SEC. 17. This act shall take effect immediately.

HYDRAULIC MINING.

Where hydraulic mining can be carried on.

§ 1424. The business of hydraulic mining may be carried on within the state of California wherever and whenever the same can be carried on without material injury to the navigable streams, or the lands adjacent thereto.

Meaning of hydraulic mining.

§ 1425. Hydraulic mining, within the meaning of this title, is mining by the means of the application of water, under pressure, through a nozzle, against a natural bank.

(For Federal regulations on hydraulic mining, see pp. 159–165.)

MINER'S INCH DEFINED.

An act fixing and defining a miner's inch of water.

[Approved March 23, 1901.]

The people of the state of California, represented in senate and assembly, do enact as follows:

SECTION 1. The standard miner's inch of water shall be equivalent or equal to one and one-half cubic feet of water per minute, measured through any aperture or orifice.

SEC. 2. All acts or parts of acts inconsistent with the provisions of this act are hereby repealed.

SEC. 3. This act shall be in effect and force sixty days from and after its passage.

LARCENY OF GOLD-DUST AND AMALGAM.

An act supplementary to an act entitled "An act concerning crimes and punishments," passed April 16, 1850.

[Approved March 20, 1872; 1871–2, 435.]

SECTION 1. Every person who shall feloniously steal, take and carry away, or attempt to take, steal, and carry from any mining claim, tunnel, sluice, under-current, riffle-box, or sulphurate (sulphuret) machine any gold-dust, amalgam, or quicksilver, the property of another, shall be deemed guilty of grand larceny, and upon conviction thereof shall be punished by imprisonment in the state prison for any term of not less than one year nor more than fourteen years.

SEC. 2. This act shall be in force from and after its passage.

REGULATION OF HOURS OF EMPLOYMENT.

An act regulating the hours of employment in underground mines, underground workings, whether for the purpose of tunneling, making excavations, or to accomplish any other purpose or design, or in smelting and reduction works.

[Approved May 30, 1913.]

The people of the state of California do enact as follows:

SECTION 1. That the period of employment for all persons who are employed or engaged in work in underground mines in search of minerals, whether base or precious, or who are engaged in such underground mines for other purposes, or who are employed or engaged in any other underground workings whether for the purpose of tunneling, making excavations or to accomplish any other purpose or design, or who are employed in smelters and other institutions for the reduction or refining of ores or metals, shall not exceed eight hours within any twenty-four hours, and the hours of employment in such employment or work day shall be consecutive, excluding, however, any intermission of time for lunch or meals; *provided*, that in case of emergency where life or property is in imminent danger, the period may be a longer time during the continuance of the exigency or emergency.

SEC. 2. Any person who shall violate any provision of this act, and any person who as foreman, manager, director or officer of a corporation, or as the employer or superior officer of any person, shall command, persuade or allow any person to violate any provision of this act, shall be guilty of a misdemeanor and upon conviction shall be punished by a fine of not less than fifty dollars ($50.00) nor more than three hundred dollars ($300.00) or by imprisonment of not more than three months. And the court shall have discretion to impose both fine and imprisonment as herein provided.

SEC. 3. All acts and parts of acts inconsistent with this act are hereby repealed.

PROVIDING FOR MINE EXITS.

An act requiring compensation for causing death by wrongful act, neglect or default.

[Approved April 26, 1862.]

SECTION 1. It shall not be lawful for any corporation, association, owner or owners of any quartz mining claim within the state of California, where such corporation, association, owner or owners employ twelve men daily, to sink down into such mine or mines any perpendicular shaft or incline beyond a depth from

the surface of three hundred feet without providing a second mode of egress from such mine, by shaft or tunnel, to connect with the main shaft at a depth of not less than one hundred feet from the surface.

SEC. 2. It shall be the duty of each corporation, association, owner or owners of any quartz mine or mines in this state, where it becomes necessary to work such mines beyond the depth of three hundred feet, and where the number of men employed therein daily shall be twelve or more, to proceed to sink another shaft or construct a tunnel so as to connect with the main working shaft of such mine as a mode of escape from underground accident or otherwise. And all corporations, associations, owner or owners of mines, as aforesaid, working at a greater depth than three hundred feet, not having any other mode of egress than from the main shaft, shall proceed as herein provided.

SEC. 3. When any corporation, association, owner or owners of any quartz mine in this state shall fail to provide for the proper egress, as herein contemplated, and where any accident shall occur, or any miner working therein shall be hurt or injured, and from injury might have escaped if the second mode of egress had existed, such corporation, association, owner or owners of the mine where the injuries shall have occurred shall be liable to the person injured in all damages that may accrue by reason thereof; and an action at law in a court of competent jurisdiction may be maintained against the owner or owners of such mine, which owners shall be jointly or severally liable for such damages. And where death shall ensue from injuries received from any negligence on the part of the owners thereof, by reason of their failure to comply with any of the provisions of this act, the heirs or relatives surviving the deceased may commence an action for the recovery of such damages.

SEC. 4. This act shall take effect and be in force six months from and after its passage.

TELEPHONE SYSTEM IN MINES.

An act providing for the establishment and maintenance of a telephone system in mines and prescribing a penalty for the violation thereof.

[Approved June 13, 1913.]

The people of the state of California do enact as follows:

SECTION 1. In all mines operated and worked in this state where a depth of more than five hundred feet underground has been reached a telephone system must be established, equipped and maintained by the owners or lessees thereof with stations at each working level below the depth aforesaid, communicating with a station thereof on the surface of any such mine.

SEC. 2. The failure or refusal of any owner or lessee to install or maintain such telephone system shall be deemed guilty of misdemeanor and punished accordingly.

FENCING ABANDONED SHAFTS.

An act to provide for the covering or fencing of abandoned mining shafts, pits or excavations, the penalty, and also the penalty for removing or destroying the covering or fencing from the same.

[Approved March 20, 1903.]

The people of the state of California, represented in senate and assembly, do enact as follows:

SECTION 1. All abandoned mining shafts, pits or abandoned excavations dangerous to passers-by or live stock shall be securely covered or fenced, and kept so, by the owners of the land or persons in charge of the same, on which such shafts, pits or other excavations are located. Any person or persons failing to comply with the provisions of this section shall be deemed guilty of a misdemeanor.

SEC. 2. All abandoned mining shafts, pits or other excavations situated on unoccupied public lands may be securely covered or fenced by order of the board of supervisors of the county wherein the same is situated, and it shall be the duty of the board of supervisors to keep the same securely fenced or covered whenever it appears to them, by proof submitted, that the same is dangerous or unsafe to man or beast. The cost of said covering or fencing to be a county charge.

SEC. 3. Any person or persons maliciously removing or destroying any covering or fencing placed around or over any shaft, pit or other excavation, as hereinbefore provided, shall be deemed guilty of a misdemeanor.

SEC. 4. This act shall take effect six months from the day of passage.

CALIFORNIA MINE BELL SIGNALS.

An act to establish a uniform system of mine bell signals, to be used in all the mines operated in the state of California, and for the protection of miners.

[Approved March 8, 1893.]

SECTION 1. Every person, company, corporation, or individual, operating any mine within the state of California—gold, silver, copper, lead, coal, or any other metal or substance—where it is necessary to use signals by means of bell or otherwise, for shafts, inclines, drifts, crosscuts, tunnels, and underground workings, shall, after the passage of this bill, adopt, use, and put in force the following system or code of mine bell signals, as follows:

1 bell, to hoist. (See Rule 2.)
1 bell, to stop if in motion.
2 bells, to lower. (See Rule 2.)
3 bells, man to be hoisted; run slow. (See Rule 2.)
4 bells, start pump if not running, or stop pump if running.
1—3 bells, start or stop air compressor.
5 bells, send down tools. (See Rule 4.)
6 bells, send down timbers. (See Rule 4.)
7 bells, accident; move bucket or cage by verbal orders only.
1—4 bells, foreman wanted.
2—1—1 bells, done hoisting until called.
2—1—2 bells, done hoisting for the day.
2—2—2 bells, change buckets from ore to water, or vice versa.
3—2—1 bells, ready to shoot in the shaft. (See Rule 3.)

Engineer's signal, that he is ready to hoist, is to raise the bucket or cage two feet and lower it again. (See Rule 3.)

Levels shall be designated and inserted in notice hereinafter mentioned. (See Rule 5.)

SEC. 2. For the purpose of enforcing and properly understanding the above code of signals, the following rules are hereby established:

Rule 1—In giving signals make strokes on bell at regular intervals. The bar (—) must take the same time as for one stroke of the bell, and no more. If timber, tools, the foreman, bucket or cage are wanted to stop at any level in the mine, signal by number of strokes on the bell, number of the level first before giving the signal for timber, tools, etc. Time between signals to be double bars (— —). Example:

6— —5 would mean stop at sixth level with tools.
4— —1—1—1— —1, would mean to stop at fourth level, man on, hoist.
2— —1—4 would mean stop at second level with foreman.

Rule 2—No person must get off or on the bucket or cage, while the same is in motion. When men are to be hoisted give the signal for men. Men *must* then get on bucket or cage, *then* give the signal to hoist. Bell cord must be in reach of man on the bucket or cage at stations.

Rule 3—After signal "Ready to shoot in shaft," engineer must give his signal when he is ready to hoist. Miners must then give the signal of "Men to be hoisted," then "spit fuse," get into the bucket, and give the signal to hoist.

Rule 4—All timbers, tools, etc., "longer than the depth of the bucket," to be hoisted or lowered, must be securely lashed at the upper end to the cable. Miners must know they will ride up or down the shaft without catching on rocks or timbers and be thrown out.

Rule 5—The foreman will see that one printed sheet of these signals and rules for each level and one for the engine-room are attached to a board not less than twelve inches wide by thirty-six inches long, and securely fasten the board up where signals can be easily read at the places above stated.

Rule 6—The above signals and rules must be obeyed. Any violation will be sufficient grounds for discharging the party or parties so doing. No person, company, corporation, or individual operating any mine within the state of California, shall be responsible for accidents that may happen to men disobeying the above rules and signals. Said notice and rules shall be signed by the person or superintendent having charge of the mine, who shall designate the name of the corporation or the owner of the mine.

SEC. 3. Any person or company failing to carry out any of the provisions of this act shall be responsible for all damages arising to or incurred by any person working in said mine during the time of such failure.

SEC. 4. This act shall take effect immediately.

FEDERAL STATUTES.

Title XXXII, Chapter 6, Revised Statutes.

SEC. 2319. All valuable mineral deposits in lands belonging to the United States, both surveyed and unsurveyed, are hereby declared to be free and open to exploration and purchase, and the lands in which they are found to occupation and purchase, by citizens of the United States and those who have declared their intention to become such, under regulations prescribed by law, and according to the local customs or rules of miners in the several mining districts, so far as the same are applicable and not inconsistent with the laws of the United States.

Lode Claims.

SEC. 2320. Mining claims upon veins or lodes of quartz or other rock in place bearing gold, silver, cinnabar, lead, tin, copper, or other valuable deposits, heretofore located, shall be governed as to length along the vein or lode by the customs, regulations, and laws in force at the date of their location. A mining claim located after the tenth day of May, eighteen hundred and seventy-two, whether located by one or more persons, may equal, but shall not exceed, one thousand five hundred feet in length along the vein or lode; but no location of a mining claim shall be made until the discovery of the vein or lode within the limits of the claim located. No claim shall extend more than three hundred feet on each side of the middle of the vein at the surface, nor shall any claim be limited by any mining regulation to less than twenty-five feet on each side of the middle of the vein at the surface, except where adverse rights existing on the tenth day of May, eighteen hundred and seventy-two, render such limitation necessary. The end lines of each claim shall be parallel to each other.

Citizenship.

SEC. 2321. Proof of citizenship, under this chapter, may consist in the case of an individual, of his own affidavit thereof; in the case of an association of persons unincorporated, of the affidavit of their authorized agent, made on his own knowledge, or upon information and belief; and in the case of a corporation organized under the laws of the United States, or of any state or territory thereof, by the filing of a certified copy of their charter or certificate of incorporation.

This is supplemented by an act of April 26, 1882, which provides:

"That applicants for mineral patents, if residing beyond the limits of the district wherein the claim is situated, may make any oath or affidavit required for proof of citizenship before the clerk of any court of record, or before any notary public of any state or territory." (22 Stats. at Large, p. 49, chap. 106.)

Extra-lateral Rights.

SEC. 2322. The locators of all mining locations heretofore made or which shall hereafter be made, on any mineral vein, lode, or ledge, situated on the public domain, their heirs and assigns, where no adverse claims exist on the tenth day of May, eighteen hundred and seventy-two, so long as they comply with the laws of the United States, and with state, territorial and local regulations not in conflict with the laws of the United States governing their possessory title, shall have the exclusive right of possession and enjoyment of all the surface included within the lines of their locations, and of all veins, lodes and ledges throughout their entire depth, the top or apex of which lies inside of such surface lines extended downward vertically, although such veins, lodes, or ledges may so far depart from a perpendicular in their course downward as to extend outside the vertical side lines of such surface locations. But their right of possession to such outside parts of such veins or ledges shall be confined to such portions thereof as lie between vertical planes drawn downward as above

described through the end lines of their locations, so continued in their own direction that such planes will intersect such exterior parts of such veins or ledges. And nothing in this section shall authorize the locator or possessor of a vein, or lode which extends in its downward course beyond the vertical lines of his claim, to enter upon the surface of a claim owned or possessed by another.

Tunnel Claims.

SEC. 2323. Where a tunnel is run for the development of a vein or lode, or for the discovery of mines, the owners of such tunnel shall have the right of possession of all veins or lodes within three thousand feet from the face of such tunnel on the line thereof, not previously known to exist, discovered in such tunnel, to the same extent as if discovered from the surface and locations on the line of such tunnel of veins or lodes not appearing on the surface, made by other parties after the commencement of the tunnel, and while the same is being prosecuted with reasonable diligence, shall be invalid, but failure to prosecute the work on the tunnel for six months shall be considered as an abandonment of the right to all undiscovered veins on the line of such tunnel.

Recording and Annual Assessments.

SEC. 2324. The miners of each mining district may make regulations not in conflict with the laws of the United States, or with the laws of the state or territory in which the district is situated, governing the location, manner of recording, amount of work necessary to hold possession of a mining claim, subject to the following requirements: The location must be distinctly marked on the ground so that its boundaries can be readily traced. All records of mining claims hereafter made shall contain the name or names of the locators, the date of the location, and such a description of the claim or claims located by reference to some natural object or permanent monument as will identify the claim. On each claim located after the tenth day of May, eighteen hundred and seventy-two, and until a patent has been issued therefor, not less than one hundred dollars' worth of labor shall be performed or improvements made during each year.

Be it enacted by the senate and house of representatives of the United States of America in congress assembled, that section two thousand, three hundred and twenty-four of the Revised Statutes be, and the same is hereby, amended so that where a person or company has or may run a tunnel for the purpose of developing a lode or lodes, owned by said person or company, the money so expended in said tunnel shall be taken and considered as expended on said lode or lodes, whether located prior to or since the passage of said act; and such person or company shall not be required to perform work on the surface of said lode or lodes in order to hold the same as required by said act. (18 Stats. at Large, page 315, chap. 41.)

An amendment of January 22, 1880, reads:

"*Provided*, that the period within which the work required to be done annually on all unpatented mineral claims shall commence on the first day of January succeeding the date of location of such claim, and this section shall apply to all claims located since the tenth day of May, Anno Domini eighteen hundred and seventy-two." (21 Stats. at Large, page 61, chap. 9.)

The federal law fixes the minimum of labor requirements. State and local laws may require additional work as part of the act of location. This has been sustained by Supreme Court decisions.

Patents.

Section 2325 of the federal statutes provides that after $500 has been expended on a mining claim in work or improvements, a patent may be applied for, upon the claim being surveyed by a United States mineral surveyor, and by the payment of $5 per acre for the land to the United States government.

PLACERS.

SEC. 2329. Claims usually called "placers" including all forms of deposit, excepting veins of quartz, or other rock in place, shall be subject to entry and patent, under like circumstances and conditions, and upon similar proceedings, as are provided for vein or lode claims; but where the lands have been previously surveyed by the United States, the entry in its exterior limits shall conform to the legal subdivisions of public lands.

Areas of Placer Claims.

SEC. 2330. Legal subdivisions of forty acres may be subdivided into ten-acre tracts, and two or more persons or associations of persons, having contiguous claims of any size, although such claims may be less than ten acres each, may make joint entry thereof; but no location of a placer claim, made after the ninth day of July, eighteen hundred and seventy, shall exceed one hundred and sixty acres for any one person or association of persons, which location shall conform to the United States surveys; and nothing in this section contained shall defeat or impair any bona fide preemption or homestead claim upon agricultural lands, or authorize the sale of the improvements of any bona fide settler to any purchaser.

SEC. 2331. Where placer claims are upon surveyed lands, and conform to legal subdivisions, no further survey or plat shall be required, and all placer mining claims located after the tenth day of May, eighteen hundred and seventy-two, shall conform as near as practicable with the United States system of public lands surveys, and the rectangular subdivisions of such surveys, and no such location shall include more than twenty acres for each individual claimant; but where placer claims can not be conformed to legal subdivisions, survey and plat shall be made as on unsurveyed lands; and where by the segregation of mineral land in any legal subdivision a quantity of agricultural land less than forty acres remains, such fractional portion of agricultural land may be entered by any party qualified by law, for homestead or preemption purposes.

Placer boundaries.

SEC. 2333. Where the same person, association, or corporation is in possession of a placer claim, and also a vein or lode included within the boundaries thereof, application shall be made for a patent for the placer claim, with the statement that it includes such vein or lode, and in such case a patent shall issue for the placer claim, subject to the provisions of this chapter, including such vein or lode upon the payment of five dollars per acre for such vein or lode claim, and twenty-five feet of surface on each side thereof. The remainder of the placer claim, or any placer claim not embracing any vein or lode claim, shall be paid for at the rate of two dollars and fifty cents per acre, together with all costs of proceedings; and where a vein or lode, such as is described in section twenty-three hundred and twenty, is known to exist within the boundaries of a placer claim, an application for a patent for such placer claim which does not include an application for the vein or lode claim shall be construed as a conclusive declaration that the claimant of the placer claim has no right of possession of the vein or lode claim; but where the existence of a vein or lode in a placer claim is not known, a patent for the placer claim shall convey all valuable mineral and other deposits within the boundaries thereof.

Substances Locatable as Placers.

Lindley on Mines, 3d ed., 1914, Sec. 420, pp. 987 et seq. says: "Among the substances, other than those of a metallic character, which have been classified as mineral, and when occurring in the form of deposits not in place, lands containing which have been held to be subject to appropriation under the placer laws, we note the following: Alum; asphaltum; borax; diamonds; guano; gypsum; kaolin or china clay; marble; mica; onyx; soda, carbonate or nitrate; slate for roofing purposes; umber; building stone. * * * Other substances require specific mention."

Under these "other substances," are detailed: Petroleum; natural gas; brick and other classes of clay; phosphates; potash. In addition to the above named the following have also "been held to be mineral by the United States Land Department and the American courts: Amber; stone of special commercial value; cement (see gypsum); coal; gravel; limestone; salt; sand; sandstone (see building stone); sulphur." (id. Sec. 97, pp. 170 et seq.)

Mining claims on stream beds.

Gravel deposits on the beds of watercourses may be appropriated under the placer laws, if the stream is not a navigable one. The beds of navigable "rivers and their banks as far as high-water mark, in some states as far as low-water mark, belong to the state, and not to the federal government. * * * The state may grant temporary privileges, or perhaps permanent rights, of dredging or carrying on other mining operations in the beds of navigable waters; *provided*, that such operations do not interfere with the public rights of navigation or the private rights of riparian owners." (id. Sec. 428, pp. 1012, 1013.)

Tide Lands—Mining claims can not be located on.

"There is no principle involved in the consideration of the public land system better settled or more clearly enunciated than that lands under tidal waters, and below the line of ordinary high tide, are not 'public lands'." Such belong to the state, subject, however, to the public right of navigation. In the cases of the beach placers of Nome, Alaska, and the oil wells below high tide at Summerland, California, the secretary of war issued permits for "operations in the navigable waters of the United States," but such permits did not confer "any rights as against the littoral owner." (id. Sec. 429, p. 1017.)

Entry of building stone lands under placer laws.

[Act of August 4, 1892, ch. 375, 27 Stat. L. 348.]

SECTION 1. Any person authorized to enter lands under the mining laws of the United States may enter lands that are chiefly valuable for building stone under the provisions of the law in relation to placer mineral claims; *provided*, that lands reserved for the benefit of the public schools or donated to any state shall not be subject to entry under this act. (27 Stat. L. 348.)

Entry of saline lands under placer laws.

[Act of January 31, 1901, ch. 186, 31 Stat. L. 745.]

All unoccupied public lands of the United States containing salt springs, or deposits of salt in any form, and chiefly valuable therefor, are hereby declared to be subject to location and purchase under the provisions of the law relating to placer mining claims; *provided*, that the same person shall not locate or enter more than one claim hereunder. (31 Stat. L. 745.)

OIL AND GAS CLAIMS.

These are located as placer claims. See sections 2329 to 2333 U. S. statutes.

An act authorizing entry of petroleum or other mineral oil lands under placer claim laws.

Any person authorized to enter lands under the mining laws of the United States may enter and obtain patents to lands containing petroleum or other mineral oils, and chiefly valuable therefor, under the provisions of the laws relating to placer mineral claims; *provided*, that lands containing such petroleum or other mineral oils which have heretofore been filed upon, claimed, or improved as mineral, but not yet patented, may be held and patented under the provisions of this act the same as if such filing, claim or improvement were subsequent to the date of the passage hereof. (29 Stat. L. 526.) Approved Feb. 11, 1897.

An act defining what shall constitute assessments on oil mining claims.

[Act of February 12, 1903, ch. 548, 32 Stat. L. 825.]

Where oil lands are located under the provisions of title thirty-two, chapter six, Revised Statutes of the United States, as placer mining claims, the annual assessment labor upon such claims may be done upon any one of a group of claims lying contiguous and owned by the same person or corporation, not exceeding five claims in all; *provided*, that said labor will tend to the development or to determine the oil-bearing character of such contiguous claims.

THE "PICKET BILL."

An act to authorize the president of the United States to make withdrawals of public lands in certain cases.

This provides also:

SEC. 2. All lands withdrawn under the provisions of this act shall at all times be open to exploration, discovery, occupation, and purchase, under the mining laws of the United States, so far as the same apply to minerals other than coal, oil, gas, and phosphates.

By the amendment of August 24, 1912, congress limited the right of exploration, etc., within the withdrawn areas, to those lands which may be found to contain *metalliferous* mineral. The scope of withdrawal was thus broadened, with the specific intention of conserving *potash* in addition to those minerals already mentioned. (37 Stats. at Large.)

However, any of these minerals may be filed upon if found in areas of the public domain *not yet withdrawn.*

MINING CLAIMS IN FOREST RESERVES.

The congressional act of June 4, 1897, provides:

"It is not the purpose or intent of these provisions, or of the act providing for such reservations, to authorize the inclusion therein of lands more valuable for the mineral therein, or for agricultural purposes, than for forest purposes."

* * *

"Nor shall anything herein prohibit any person from entering upon such forest reservations for all proper and lawful purposes, including that of prospecting, locating and developing the mineral resources thereof; *provided*, that such persons comply with the rules and regulations covering such forest reservations."

* * *

"And any mineral lands in any forest reservation which have been or may be shown to be such and subject to entry under the existing mining laws of the United States and the rules and regulations applying thereto, shall continue to be subject to such location and entry notwithstanding any provisions herein contained."

Under these statutes it is now held by the land department that the forest reserves are open to the location of mining claims. There can be no doubt of the meaning of congress upon the subject: That lands within the forest reserves are subject to the operation of the mining laws.

CALIFORNIA DEBRIS COMMISSION.

An act to create the California Debris Commission and regulate hydraulic mining in the state of California.

Be it enacted by the senate and house of representatives of the United States of America in congress assembled, That a commission is hereby created, to be known as the California Debris Commission, consisting of three members. The president of the United States shall by and with the advice and consent of the senate, appoint

the commission from officers of the corps of engineers, United States army. Vacancies occurring therein shall be filled in like manner. It shall have the authority, and exercise the powers hereinafter set forth, under the supervision of the chief of engineers and direction of the secretary of war.

SEC. 2. That said commission shall organize within thirty days after its appointment by the selection of such officers as may be required in the performance of its duties, the same to be selected from the members thereof. The members of said commission shall receive no greater compensation than is now allowed by law to each, respectively, as an officer of said corps of engineers. It shall also adopt rules and regulations, not inconsistent with law, to govern its deliberations and prescribe the method of procedure under the provisions of this act.

SEC. 3. That the jurisdiction of said commission, in so far as the same affects mining carried on by the hydraulic process shall extend to all such mining in the territory drained by the Sacramento and San Joaquin river systems in the state of California. Hydraulic mining, as defined in section eight hereof, directly or indirectly injuring the navigability of said river systems, carried on in said territory other than as permitted under the provisions of this act is hereby prohibited and declared unlawful.

SEC. 4. That it shall be the duty of said commission to mature and adopt such plan or plans, from examinations and surveys already made and from such additional examinations and surveys as it may deem necessary, as will improve the navigability of all the rivers comprising said systems, deepen their channels, and protect their banks. Such plan or plans shall be matured with a view of making the same effective as against the encroachment of and damage from debris resulting from mining operations, natural erosion, or other causes, with a view of restoring, as near as practicable and the necessities of commerce and navigation demand, the navigability of said rivers to the condition existing in eighteen hundred and sixty, and permitting mining by the hydraulic process, as the term is understood in said state, to be carried on, provided the same can be accomplished without injury to the navigability of said rivers or the lands adjacent thereto.

SEC. 5. That it shall further examine, survey, and determine the utility and practicability, for the purposes hereinafter indicated, of storage sites in the tributaries of said rivers and in the respective branches of said tributaries, or in the plains, basins, sloughs, and tule and swamp lands adjacent to or along the course of said rivers, for the storage of debris or water or as settling reservoirs, with the object of using the same by either or all of these methods to aid in the improvement and protection of said navigable rivers by preventing deposits therein of debris resulting from mining operations, natural erosion, or other causes, or for affording relief thereto in flood time and providing sufficient water to maintain scouring force therein in the summer season; and in connection therewith to investigate such hydraulic and other mines as are now or may have been worked by methods intended to restrain the debris and material moved in operating such mines by impounding dams, settling reservoirs, or otherwise, and in general to make such study of and researches in the hydraulic mining industry as science, experience and engineering skill may suggest as practicable and useful in devising a method or methods whereby such mining may be carried on as aforesaid.

SEC. 6. That the said commission shall from time to time note the conditions of the navigable channels of said river systems, by cross-section surveys or otherwise, in order to ascertain the effect therein of such hydraulic mining operations as may be permitted by its orders and such as is caused by erosion, natural or otherwise.

SEC. 7. That said commission shall submit to the chief of engineers for the information of the secretary of war, on or before the fifteenth day of November of each year a report of its labors and transactions, with plans for the construction, completion, and preservation of the public works outlined in this act, together with estimates of the cost thereof, stating what amounts can be profitably expended thereon each year. The secretary of war shall thereupon submit same to congress on or before the meeting thereof.

SEC. 8. That for the purpose of this act "hydraulic mining" and "mining by the hydraulic process," are hereby declared to have the meaning and application given to said terms in said state.

SEC. 9. That the individual proprietor or proprietors, or in case of a corporation its manager or agent appointed for that purpose, owning mining ground in the territory in the state of California mentioned in section three hereof, which it is desired to work by the hydraulic process, must file with said commission a verified petition, setting forth such facts as will comply with law and the rules prescribed by said commission.

SEC. 10. That said petition shall be accompanied by an instrument duly executed and acknowledged, as required by the law of the said state, whereby the owner or owners of such mine or mines surrender to the United States the right and privilege to regulate by law, as provided in this act, or any law that may hereafter be enacted, or by such rules and regulations as may be prescribed by virtue thereof the manner and method in which the debris resulting from the working of said mine or mines shall be restrained, and what amount shall be produced therefrom; it being understood that the surrender aforesaid shall not be construed as in any way affecting the right of such owner or owners to operate said mine or mines by any other process or method now in use in said state; *provided*, that they shall not interfere with the navigability of the aforesaid rivers.

SEC. 11. That the owners of several mining claims situated so as to require a common dumping ground or dam or other restraining works for the debris issuing therefrom in one or more sites may file a joint petition setting forth such facts in addition to the requirements of section nine hereof; and where the owner of a hydraulic mine or owners of several such mines have and use common dumping sites for impounding debris or as settling reservoirs which sites are located below the mine of an applicant not entitled to use same, such fact shall also be stated in said petition. Thereupon the same proceedings shall be had as provided for herein.

SEC. 12. A notice specifying briefly the contents of said petition and fixing a time previous to which all proofs are to be submitted shall be published by said commission in some newspaper or newspapers of general circulation in the communities interested in the matter set forth therein. If published in a daily paper such publication shall continue for at least ten days; if in a weekly paper in at least three issues of the same. Pending publication thereof said commission, or a committee thereof, shall examine the mine and premises described in such petition. On or before the time so fixed all parties interested, either as petitioners or contestants, whether miners or agriculturists, may file affidavits, plans, and maps in support of their respective claims. Further hearings, upon notice to all parties of record, may be granted by the commission when necessary.

SEC. 13. That in case a majority of the members of said commission, within thirty days after the time so fixed, concur in a decision in favor of the petitioner or petitioners, the said commission shall thereupon make an order directing the methods and specifying in detail the manner in which operations shall proceed in such mine or mines; what restraining or impounding works, if facilities therefor can be found, shall be built, and maintained; how and of what material; where to be located; and in general set forth such further requirements and safeguards as will protect the public interests and prevent injury to the said navigable rivers, and the lands adjacent thereto, with such further conditions and limitations as will observe all the provisions of this act in relation to the working thereof and the payment of taxes on the gross proceeds of the same; *provided*, that all expense incurred in complying with said order shall be borne by the owner or owners of such mine or mines.

SEC. 14. That such petitioner or petitioners must within a reasonable time present plans and specifications of all works required to be built in pursuance of said order for examination, correction, and approval by said commission; and thereupon work may immediately commence thereon under the supervision of said commission or representative thereof attached thereto from said corps of engineers, who shall inspect same from time to time. Upon completion thereof, if found in every respect

to meet the requirements of the said order and said approved plans and specifications, permission shall thereupon be granted to the owner or owners of such mine or mines to commence mining operations, subject to the conditions of said order and the provisions of this act.

SEC. 15. That no permission granted to a mine owner or owners under this act shall take effect, so far as regards the working of a mine, until all impounding dams or other restraining works, if any are prescribed by the order granting such permission, have been completed and until the impounding dams or other restraining works or settling reservoirs provided by said commission have reached such a stage as in the opinion of said commission, it is safe to use the same; *provided, however*, that if said commission shall be of the opinion that the restraining and other works already constructed at the mine or mines shall be sufficient to protect the navigable rivers of said systems and the work of said commission, then the owner or owners of such mine or mines may be permitted to commence operations.

SEC. 16. That in case the joint petition referred to in section eleven hereof is granted, the commission shall fix the respective amounts to be paid by each owner of such mines toward providing and building necessary impounding dams or other restraining works. In the event of a petition being filed after the entry of such order, or in case the impounding dam or dams or other restraining works have already been constructed and accepted by said commission, the commission shall fix such amount as may be reasonable for the privilege of dumping therein, which amount shall be divided between the original owners of such impounding dams or other restraining works in proportion to the amount respectively paid by each party owning same. The expense of maintaining and protecting such joint dam or works shall be divided among mine owners using the same in such proportion as the commission shall determine. In all cases where it is practicable, restraining and impounding works are to be provided, constructed and maintained by mine owners near or below the mine or mines before reaching the main tributaries of said navigable waters.

SEC. 17. That at no time shall any more debris be permitted to be washed away from any hydraulic mine or mines situated on the tributaries of said rivers and the respective branches of each, worked under the provisions of this act, than can be impounded within the restraining works erected.

SEC. 18. That the said commission may at any time when the condition of the navigable rivers or when the capacities of all impounding and settling facilities erected by mine owners or such as may be provided by government authority require same, modify the order granting the privilege to mine by the hydraulic mining process so as to reduce amount thereof to meet the capacities of the facilities then in use, or, if actually required in order to protect the navigable rivers from damage, may revoke same until the further notice of the commission.

SEC. 19. That an intentional violation on the part of a mine owner or owners, company, or corporation, or the agents or the employees of either, of the conditions of the order granted pursuant to section thirteen, or such modifications thereof as may have been made by said commission, shall work a forfeiture of the privileges thereby conferred, and upon notice being served by the order of said commission upon such owner or owners, company or corporation, or agent in charge, work shall immediately cease. Said commission shall take necessary steps to enforce its orders in case of the failure, neglect, or refusal of such owner or owners, company or corporation, or agents thereof, to comply therewith, or in the event of any person or persons, company or corporation working by said process in said territory contrary to law.

SEC. 20. That said commission, or committee therefrom or officer of said corps assigned to duty under its orders, shall, whenever deemed necessary, visit said territory and all mines operating under the provisions of this act. A report of such examination shall be placed on file.

SEC. 21. That the said commission is hereby granted the right to use any of the public lands of the United States, or any rock, stone, timber, trees, brush, or material thereon or therein, for any of the purposes of this act; and the secretary of the interior is hereby authorized and requested, after notice has been filed with the commissioner of the general land office by said commission, setting forth what public

lands are required by it under the authority of this section, that such land or lands shall be withdrawn from sale and entry under the laws of the United States.

SEC. 22. That any person or persons who wilfully or maliciously injure, damage, or destroy, or attempt to injure, damage or destroy, any dam or other work erected under the provisions of this act for restraining, impounding, or settling purposes, or for use in connection therewith, shall be guilty of a misdemeanor, and upon conviction thereof shall be fined not to exceed the sum of five thousand dollars or be imprisoned not to exceed five years, or by both such fine and imprisonment, in the discretion of the court. And any person or persons, company or corporation, their agents or employees, who shall mine by the hydraulic process directly or indirectly injuring the navigable waters of the United States, in violation of the provisions of this act, shall be guilty of a misdemeanor, and upon conviction thereof shall be punished by a fine not exceeding five thousand dollars, or by imprisonment not exceeding one year, or by both such fine and imprisonment, in the discretion of the court; *provided*, that this section shall take effect on the first day of May, eighteen hundred and ninety-three.

SEC. 23. That upon the construction by the said commission of dams or other works for the detention of debris from hydraulic mines and the issuing of the order provided for by this act to any individual, company, or corporation to work any mine or mines by hydraulic process, the individual, company, or corporation operating thereunder working any mine or mines by hydraulic process, the debris from which flows into or is in whole or in part restrained by such dams or other works erected by said commission, shall pay a tax of three per centum on the gross proceeds of his, their, or its mine so worked; which tax of three per centum shall be ascertained and paid in accordance with regulations to be adopted by the secretary of the treasury, and the treasurer of the United States is hereby authorized to receive the same. All sums of money paid into the treasury under this section shall be set apart and credited to a fund to be known as the "Debris Fund," and shall be expended by said commission under the supervision of the chief of engineers and direction of the secretary of war, in addition to the appropriations made by law in the construction and maintenance of such restraining works and settling reservoirs as may be proper and necessary; *provided*, that said commission is hereby authorized to receive and pay into the treasury from the owner or owners of mines worked by the hydraulic process, to whom permission may have been granted so to work under the provisions thereof, such money advances as may be offered to aid in the construction of such impounding dams or other restraining works, or settling reservoirs, or sites therefor, as may be deemed necessary by said commission to protect the navigable channels of said river systems, on condition that all moneys so advanced shall be refunded as the said tax is paid into the said debris fund; *and provided, further*, that in no event shall the government of the United States be held liable to refund same except as directed by this section.

SEC. 24. That for the purpose of securing harmony of action and economy of expenditures in the work to be done by the United States and the state of California, respectively, the former in its plans for the improvement and protection of the navigable streams and to prevent the depositing of mining debris or other materials within the same, and the latter in its plans authorized by law for the reclamation, drainage, and protection of its lands, or relating to the working of hydraulic mines, the said commission is empowered to consult thereon with a commission of engineers of said state, if authorized by said state for said purpose, the result of such conference to be reported to the chief of engineers of the United States army, and if by him approved shall be followed by said commission.

SEC. 25. That said commission, in order that such material as is now or may hereafter be lodged in the tributaries of the Sacramento and San Joaquin river systems resulting from mining operations, natural erosion, or other causes, shall be prevented from injuring the said navigable rivers or such of the tributaries of either as may be navigable and the land adjacent thereto, is hereby directed and empowered, when appropriations are made therefor by law, or sufficient money is deposited for that purpose in said debris fund, to build at such points above the head of navigation in said rivers and on the main tributaries thereof, or branches of such tributaries,

or at any place adjacent to the same, which in the judgment of said commission will effect said object (the same to be of such material as will insure safety and permanency), such restraining or impounding dams and settling reservoirs, with such canals, locks, or other works adapted and required to complete same. The recommendations contained in executive document numbered two hundred and sixty-seven, fifty-first congress, second session, and executive document numbered ninety-eight, forty-seventh congress, first session, as far as they refer to impounding dams, or other restraining works are hereby adopted, and the same are directed to be made the basis of operations. The sum of fifteen thousand dollars is hereby appropriated, from moneys in the treasury not otherwise appropriated, to be immediately available to defray the expenses of said commission.

Approved March 1, 1893.

INSTRUCTIONS TO OWNERS AND OPERATORS OF HYDRAULIC MINES IN CALIFORNIA.

November, 1915.

1. The California Debris Commission is composed of three officers of the Corps of Engineers, United States Army, who are appointed by the President of the United States, with the advice and consent of the United States Senate, under the authority of the Act of Congress, approved March 1, 1893. The Commission is charged by this act with the enforcement of its provisions, including such regulation and control of hydraulic mining in the drainage areas of the Sacramento and San Joaquin rivers of the State of California as is necessary to cause the tailings from such mining to be so impounded in the vicinity of the mine as to prevent injury to the navigable rivers and adjacent lands. The owners and operators of such mines are required by this law to comply strictly with such requirements of the Commission as may be deemed necessary to effect this purpose. An extreme penalty of $5,000 fine and one year's imprisonment is provided for violation of the act.

2. Hydraulic mining embraces all mining operations where water is used under pressure through a nozzle against any bank of earth, gravel, or other similar material, thus eroding the bank. It is forbidden by law except under the supervision of the Commission.

3. The law requires that in all cases a license or written permission must be obtained from the Commission before hydraulic mining in the regions mentioned can be legally carried on.

4. Licenses or permission to mine by the hydraulic process are revocable by the Commission, and will not be given unless the requirements of the Commission are complied with as to sufficiency of suitable restraining barriers or dams. Licenses, when granted, will be suspended or revoked for failure to properly maintain such barriers or dams or for failure to make the reports and furnish information asked for by the Commission.

5. Licenses are obtained by making application to the California Debris Commission, San Francisco, Cal., on the special blank form issued by the Commission, copies of which will be sent on request, free of cost.

6. Licenses are not transferable and are valid only for the operations of the individual or company, and for the special mine named in the license.

7. By the terms of the law an application for a license must be advertised by the Commission in the newspapers to allow any protests to be filed with the Commission. This advertising usually takes about three weeks.

8. As soon as practicable after receiving an application, the Commission, or its representative, will visit the sites proposed by the applicants for the restraining works. If these are found satisfactory, and if no suitably substantiated protest is filed, the Commission will issue an order granting authority to construct the dams or barriers, with the requirements as to the work. Any work on a dam before such authorization is wholly at the builder's risk, and may not be accepted by the Commission. Any variation in location, order, or character of work from that specified by the Commission may also cause rejection of the dam.

9. At least three weeks before beginning any of the work under the order of the Commission, the interested party must give the Commission notice to permit such arrangement for such inspection of the work as the Commission may require. The expense of this inspection, including salary, traveling and other expenses of the inspectors, as well as other cost involved in securing compliance with the order granting authority to construct the restraining works must, under the law, be borne by the mine owners or operators. The amount of the Commission's estimate of the expense of inspection must be deposited with the Commission, in a form acceptable to it, prior to the beginning of the works. If this deposit proves insufficient for the purpose, additional deposits must be made when called for by the Commission. After inspection any unused balance will be returned, with a statement showing expenditures made from the deposits. After the restraining works are found satisfactory to the Commission it will issue a revocable license to mine. *Until the license is issued it is illegal to mine.*

10. When the license has been issued, a report must be submitted every month on blank form for this purpose furnished by the Commission upon request. If no mining is carried on for any month, the small form is to be used; otherwise, the large form must be forwarded. All blank spaces should be carefully and accurately filled.

11. In case of any accident to a restraining dam affecting its efficiency, mining must immediately cease and the Commission must be notified promptly.

12. Dams must be kept water tight, and the parties using them must promptly check leakage. Before the debris held back has, within such distance (not less than one hundred feet) from the weir as the Commission may require, risen to a point three (3) feet below the level of the lowest point of the restraining barrier, or weir, mining must stop until more impounding capacity is provided in accordance with methods then affirmatively approved by the Commission.

13. Due notice of change in names of mines must be given to the Commission by the parties at interest.

14. The mine owners are usually expected to have the inspector met at the nearest railway or stage station and taken to the mine and back. As many regions where mines are located are inaccessible in winter time, applications for licenses and inspections should be submitted as early in the season as practicable. Delay in attending to this may occasion the loss of considerable time or an entire season.

15. To avoid delay due to loss of letters it is suggested that requests be repeated within a reasonable time, if not promptly acknowledged or acted upon. All communications should be addressed to the Secretary, California Debris Commission, Room 405, Custom House, San Francisco, Cal.

16. Construction of any restraining barrier not affirmatively authorized by the Commission, is prohibited. Where there exists above any restraining barrier authorized by the Commission, any barrier not now approved by it as permanent, the total capacity of the authorized barrier up to its crest and to such slope as the material may attain must be ample, in addition to that required by Rule 12, to care for the material temporarily restrained when it finally reaches the permanent barrier.

By direction of the California Debris Commission:

L. H. RAND,
Major, Corps of Engineers, U. S. Army,
Secretary.

FORMS FOR LOCATION NOTICES.

The following forms for mineral location notices have been found to fill the requirements of the statutes:[11]

NOTICE OF QUARTZ LODE LOCATION.

Notice is hereby given, That I, _____, a citizen of the United States, have discovered a vein of rock in place, carrying gold, silver, copper, and other valuable deposits, upon which I have erected a discovery monument and posted this notice, as hereinafter set forth; that in accordance with the provision of Chapter 6, Title 32 of the Revised Statutes of the United States and the laws of the State of California, I hereby claim fifteen hundred linear feet of said vein, measured thereon as hereinafter set forth. Said discovery was made on the _____ day of _____, 19____. Immediately upon making the same, and on the _____ day of _____, 19____, I erected at the point of discovery, a substantial monument, consisting of a mound of rocks and _____ and posted thereon this notice.

The * general course of said vein is _____ and _____. I claim in length thereon _____ feet _____ and _____ feet _____ from said discovery monument. I also claim three hundred feet on each side of the center of the vein. This vein or claim shall be known as and called the _____ _____. It is situated in _____Mining District, and in † Sec. _____, Tp. _____, R. _____, B. and M., in _____ County, California, and the discovery monument _____ being placed about § _____ _____ _____ from _____

That the following is a description of said location as marked on the ground: ‡ commencing at the _____ of said claim, a _____ _____ from which initial point the discovery monument is distant about _____ feet in a _____ direction; _____ thence ‖_____ _____

Dated and posted on the ground, this _____ day of _____, 19____.

Witness _____

_____

Locator.

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[11]Wilson's Mining Laws, 1911, pp. 60-62.

*Make this description in accordance with the facts, as "The general course of said vein is north and south. I claim in length thereon 500 feet north and 1,000 feet south from said discovery monument."

†If the claim is upon surveyed land, give the section, township and range, if possible. This is not required by law, but makes a much better description.

§Here refer to some natural object or permanent monument so as to identify the locality of the claim, in compliance with section 2324, Revised Statutes U. S. A road, house, tree, known mountain or peak, government corner, mill, or known mining claim, are such objects or monuments. As, "About one mile directly east from John Doe's quartz mill and 400 rods west from the Last Hope mine," etc.

‡Here state: "Commencing at the N. E. corner of said claim, a mound of rocks 4 ft high," or at any other corner or point in the boundary; give the distance and direction from this initial monument to the discovery monument, and then locate the discovery with reference to some natural object or permanent monument.

‖Here follows a description of the claim from the initial monument. For instance: "Thence 600 ft. northwesterly to the N. W. corner of said claim, at which point is a mound of rocks 2½ ft. high, marked so-and-so (if marked); thence 1,500 ft. southwesterly to the S. W. corner of said claim, being a mound of rocks," etc.; so going around the claim to the point of beginning.

NOTICE OF LOCATION OF PLACER CLAIM.

Notice is hereby given, That _____ citizen____ of the United States, h____ this _____ day of _____, 19____, discovered a valuable placer deposit within the limits of this claim; that by virtue of said discovery, _____ _____ ha____ located, and hereby locate and claim the following described land, situate in _____ Mining District, _____ County, California, to wit: *_____ of section _____ Township _____, Range _____, B. and M., containing_____ acres.† Said claim is hereby named _____ Placer Claim. Said claim is marked upon the ground as follows: ‡_____

This notice is posted on a mound of rocks at the point of discovery, situated §

_____

Dated and posted on the ground, this ____ day of _____, 19____.

_____

Locator.

*The statute provides that the locator must give "a description of the claim by reference to legal subdivisions of sections, if the location is made in conformity with the public surveys; otherwise a description with reference to some natural object or permanent monument as will identify the claim."

†When not described by legal subdivisions, the description should conform to that contained in the final certificate of location of a lode claim.

‡The statute provides that, whether described by legal subdivisions or not, the location shall be marked by the locator on the ground, and as the affidavit to be filed later is not required to contain a description of the claim, we think this notice should state how the location is marked; as, for instance, "At the N. E. corner of said tract a mound of rocks 3 ft. high, marked so-and-so (if marked), and at the N. W. corner a stake in a mound of rocks, marked," etc., and so on for each monument enclosing the claim.

§Here state where the discovery is located, as, for instance, "20 feet S. W. of the N. E. corner monument."

The foregoing form of placer notice may be used for location of all deposits which are classed under placer laws.

A duplicate of either of these notices must be filed for record with the county recorder within thirty days from the discovery; and the locator is allowed thirty days to mark his location on the ground.

APPENDIX.

PUBLICATIONS OF THE CALIFORNIA STATE MINING BUREAU.

Publications of this Bureau will be sent on receipt of the requisite amount. Only stamps, coin or money orders will be accepted in payment.

Money orders should be made payable to the STATE MINING BUREAU.

Personal checks will not be accepted.

REPORTS.

Asterisk (*) indicates the publication is out of print.

			Price.
*Report	I.	Henry G. Hanks. 1880.	
*Report	II.	Henry G. Hanks. 1882.	
*Report	III.	Henry G. Hanks. 1883.	
*Report	IV.	Henry G. Hanks. 1884.	
*Report	V.	Henry G. Hanks. 1885.	
*Report	VI.	Part 1. Henry G. Hanks. 1886.	
*Report	VI.	Part 2. Wm. Irelan, Jr. 1886.	
*Report	VII.	Wm. Irelan, Jr. 1887.	
*Report	VIII.	Wm. Irelan, Jr. 1888.	
*Report	IX.	Wm. Irelan, Jr. 1889.	
*Report	X.	Wm. Irelan, Jr. 1890.	
Report	XI.	Wm. Irelan, Jr. 1892. (First biennial)	$1.00
*Report	XII.	J. J. Crawford. 1894. (Second biennial)	----
*Report	XIII.	J. J. Crawford. 1896. (Third biennial)	----
Chapters of State Mineralogist's Report, Fletcher Hamilton:			
Mines and Mineral Resources of Imperial and San Diego counties—F. J. H. Merrill. 1914			.35
Mines and Mineral Resources, Amador, Calaveras and Tuolumne counties—W. B. Tucker. 1915			.50
Mines and Mineral Resources, Colusa, Glenn, Lake, Marin, Napa, Solano, Sonoma and Yolo counties—Walter W. Bradley. 1915			.50
Mines and Mineral Resources, Del Norte, Humboldt and Mendocino counties—F. L. Lowell. 1915			.25
Mines and Mineral Resources, Fresno, Kern, Kings, Madera, Mariposa, Merced, San Joaquin and Stanislaus counties—Walter W. Bradley, G. C. Brown, F. L. Lowell and R. P. McLaughlin. 1915			.50
Mines and Mineral Resources, Shasta, Siskiyou and Trinity counties—G. C. Brown. 1915			.50

BULLETINS.

*Bulletin	1.	Desiccated Human Remains.—Winslow Anderson. 1888	----
*Bulletin	2.	Methods of Mine Timbering.—W. H. Storms. 1894	----
*Bulletin	3.	Gas and Petroleum Yielding Formations of the Central Valley of California.—W. L. Watts. 1894	----
*Bulletin	4.	Catalogue of California Fossils (Parts 2, 3, 4 and 5).—J. G. Cooper. 1894	----
*Bulletin	5.	The Cyanide Process: Its Practical Application and Economical Results.—A. Scheidel. 1894	----
Bulletin	6.	California Gold Mill Practices.—E. B. Preston. 1895	.50
*Bulletin	7.	Mineral Production of California, by Counties, 1894.—Chas. G. Yale. (Tabulated sheet)	----
*Bulletin	8.	Mineral Production of California, by Counties, 1895.—Chas. G. Yale. (Tabulated sheet)	----
*Bulletin	9.	Mine Drainage, Pumps, etc.—Hans C. Behr. 1896	----
*Bulletin	10.	A Bibliography Relating to the Geology, Palæontology, and Mineral Resources of California.—A. W. Vogdes. 1896	----
*Bulletin	11.	Oil and Gas Yielding Formations of Los Angeles, Ventura and Santa Barbara Counties.—W. L. Watts. 1896	----
*Bulletin	12.	Mineral Production of California, by Counties, 1896.—Chas. G. Yale. (Tabulated sheet)	----
*Bulletin	13.	Mineral Production of California, by Counties, 1897.—Chas. G. Yale. (Tabulated sheet)	----
*Bulletin	14.	Mineral Production of California, by Counties, 1898.—Chas. G. Yale. (Tabulated sheet)	----
Bulletin	15.	Map of Oil City Oil Fields, Fresno County.—J. H. Means	----
*Bulletin	16.	The Genesis of Petroleum and Asphaltum in California.—A. S. Cooper. 1899	----
*Bulletin	17.	Mineral Production of California, by Counties, 1899.—Chas. G. Yale. (Tabulated sheet)	----
*Bulletin	18.	The Mother Lode Region of California.—W. H. Storms, 1900	----
*Bulletin	19.	Oil and Gas Yielding Formations of California.—W. L. Watts. 1900	----

PUBLICATIONS OF THE CALIFORNIA STATE MINING BUREAU—Continued.

Asterisk (*) indicates the publication is out of print.

		Price.
*Bulletin 20.	Synopsis of General Report of State Mining Bureau.—W. L. Watts. 1900	----
*Bulletin 21.	Mineral Production of California, by Counties, 1900.—Chas. G. Yale. (Tabulated sheet)	----
*Bulletin 22.	Mineral Production of California for Fourteen Years.—Chas. G. Yale. 1900. (Tabulated sheet)	
Bulletin.	Reconnaissance of the Colorado Desert Mining District.—Stephen Bowers. 1901	----
Bulletin 23.	The Copper Resources of California.—P. C. DuBois, F. M. Anderson, J. H. Tibbits, and G. A. Tweedy. 1902	.50
*Bulletin 24.	The Saline Deposits of California.—G. E. Bailey. 1902	----
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*Trinity County	----
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Register of Oil Wells (with map), Los Angeles City	.35

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Unmounted	.30
Forest Reserves in California—	
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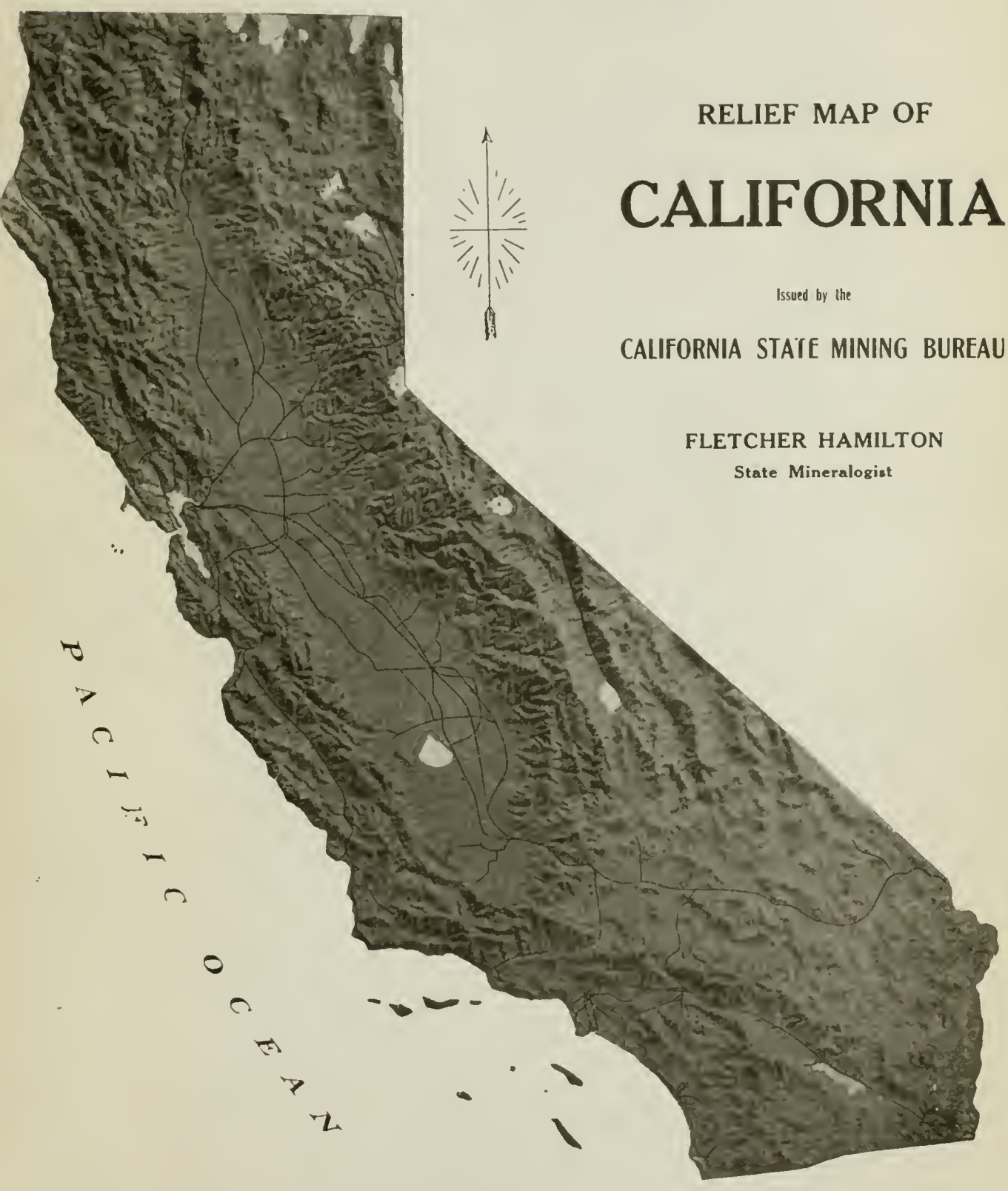
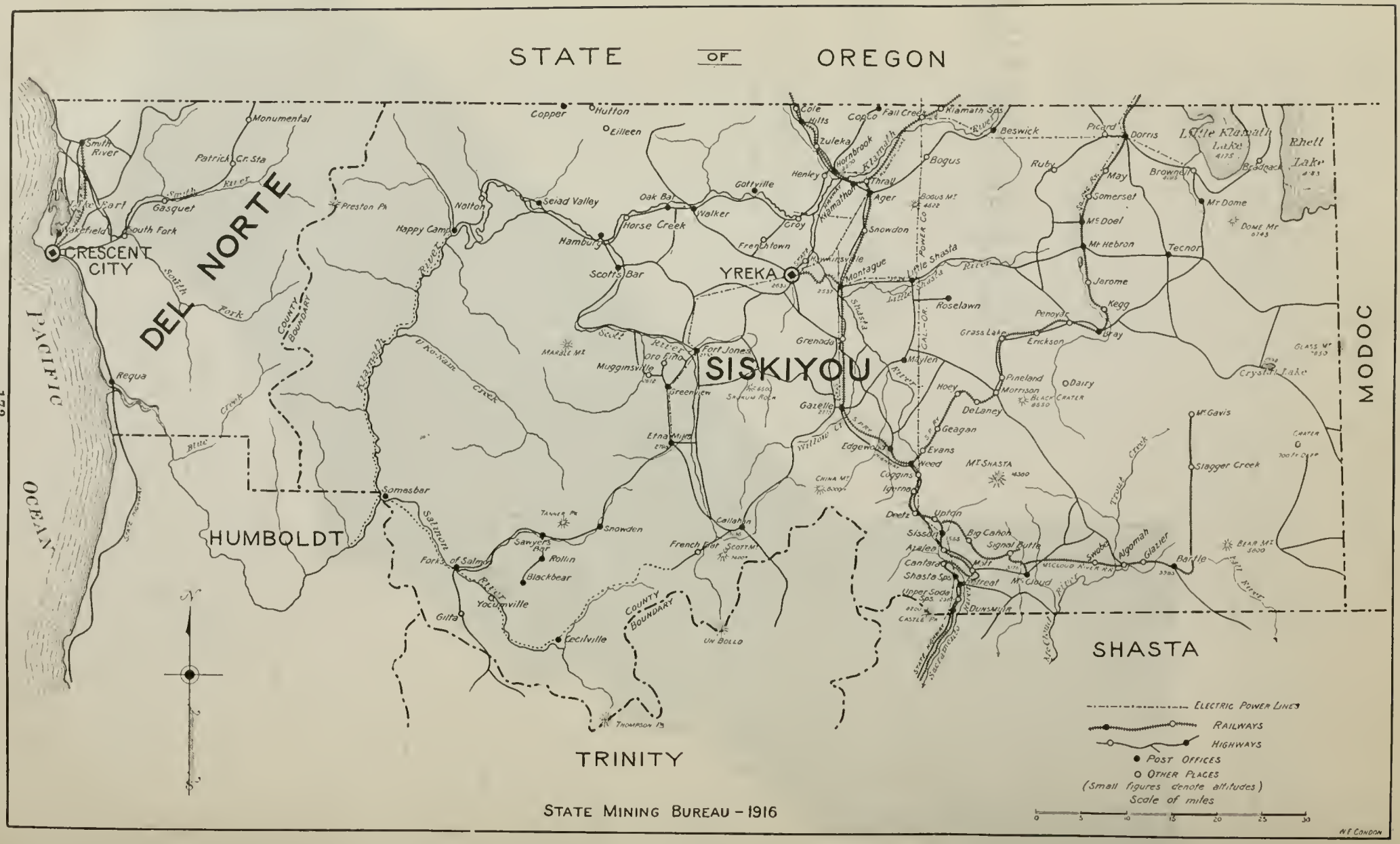
*Mineral and Relief Map of California	----
El Dorado County, Showing Boundaries of National Forests	.20
Madera County, Showing Boundaries of National Forests	.20
Placer County, Showing Boundaries of National Forests	.20
Shasta County, Showing Boundaries of National Forests	.20
Sierra County, Showing Boundaries of National Forests	.20
Siskiyou County, Showing Boundaries of National Forests	.20
Trinity County, Showing Boundaries of National Forests	.45
Tuolumne County, Showing Boundaries of National Forests	.20
*Mother Lode Region	----
Desert Region of Southern California	.10
Minaret District, Madera County	.20
Copper Deposits in California	.05
Calaveras County	.25
Plumas County	.25
Tuolumne County	.25

DETERMINATION OF MINERAL SAMPLES.

Samples (limited to three at one time) of any mineral found in the state may be sent to the Bureau for identification, and the same will be classified free of charge. No samples will be determined if received from points outside the state. It must be understood that no assays, or quantitative determinations will be made. Samples should be in lump form if possible, and marked plainly with name of sender on outside of package, etc. No samples will be received unless delivery charges are prepaid. A letter should accompany sample, giving locality where mineral was found and the nature of the information desired.

The following county maps show all towns, postoffices, railroads, stage lines, and the highways. They are especially valuable to all who wish to leave the railroad and penetrate to the interior of the mining districts of the state. These maps must not be reproduced without obtaining permission from the Mining Bureau.





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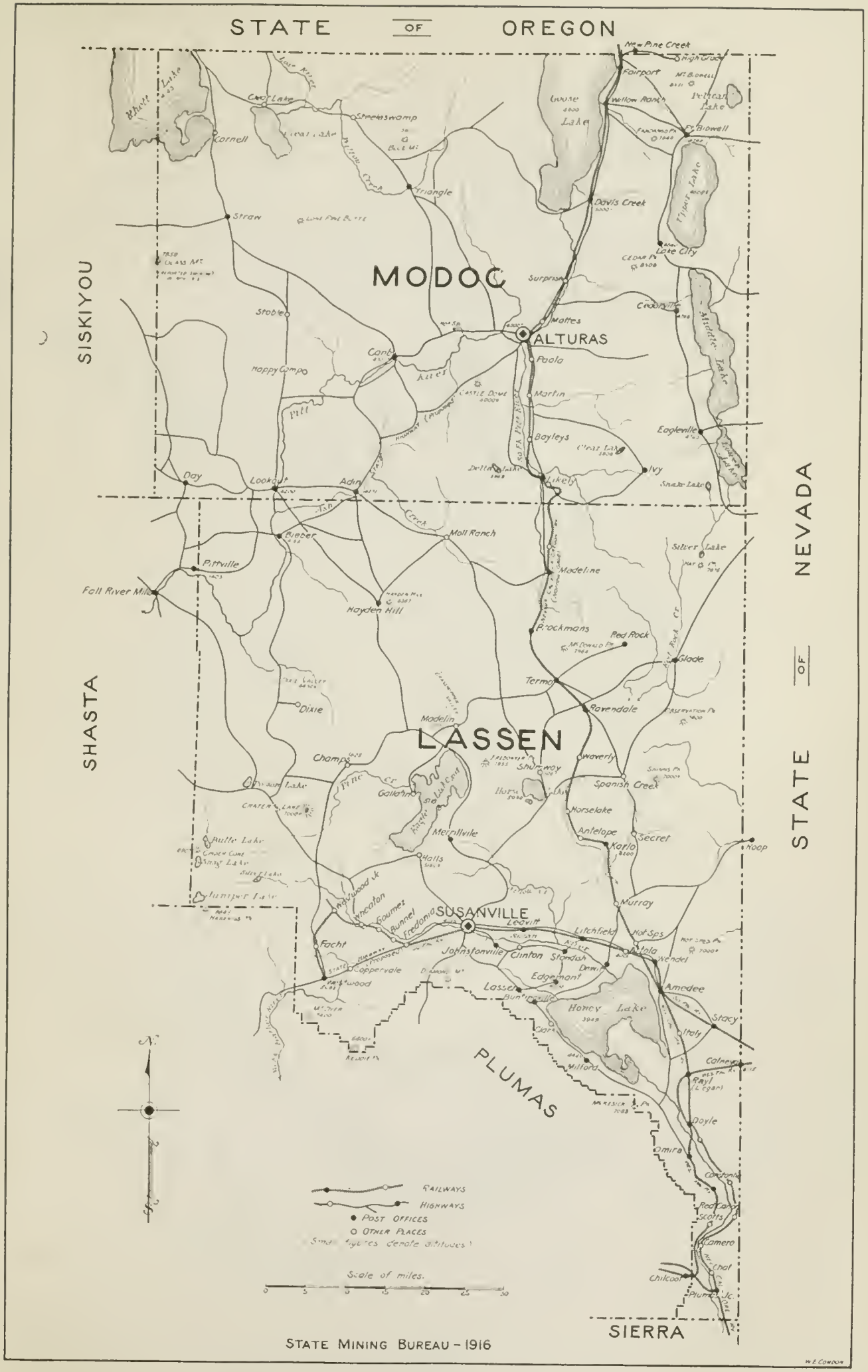
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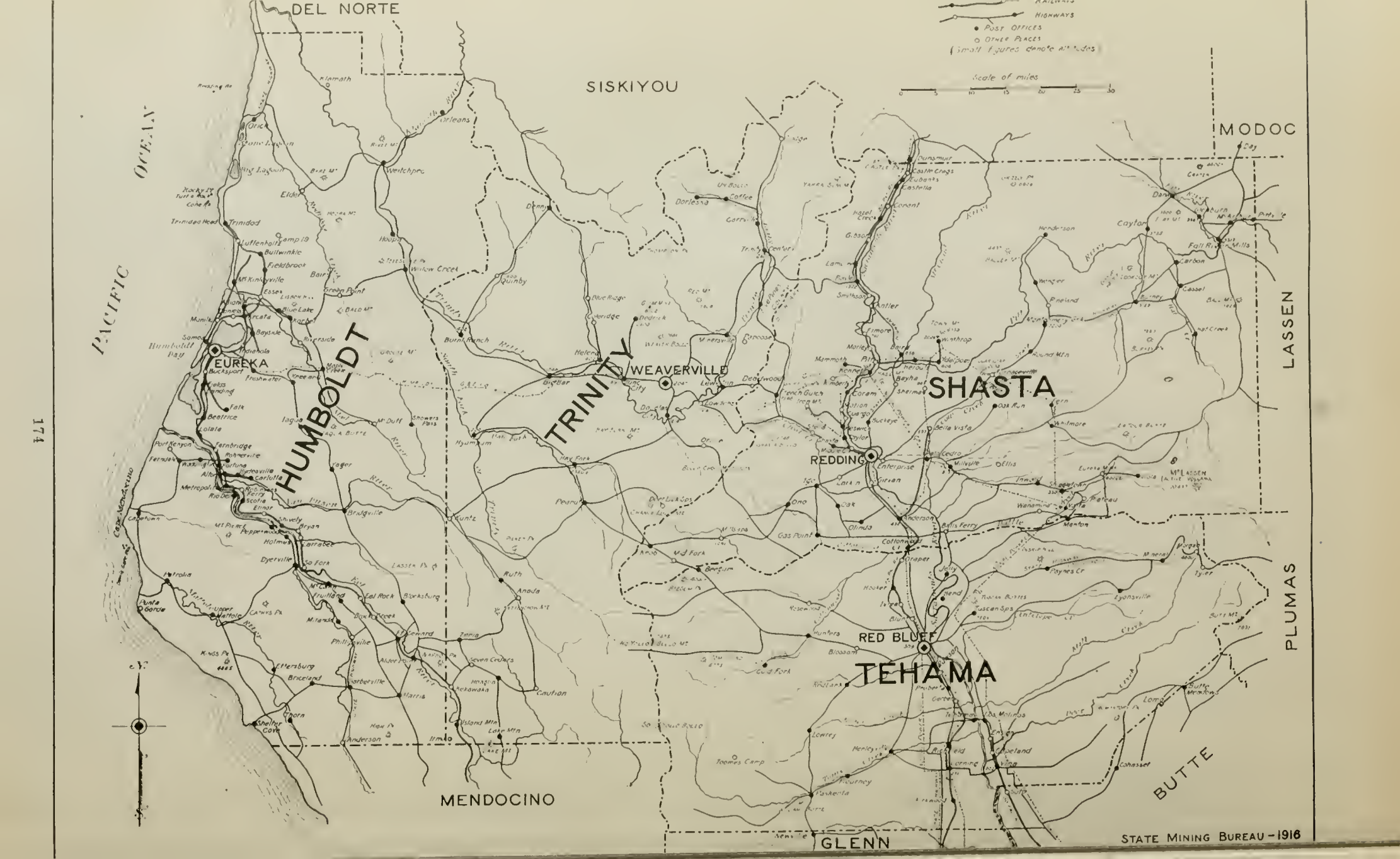
STATE OF NEVADA
SISKIYOU
SHASTA
MODOC
LASSEN
PLUMAS
SIERRA
ALTURAS
SUSANVILLE
Cornell
Stran
Stobie
Happy Camp
Cant
Paola
Martin
Bayleys
Ivy
Eagleville
Lake City
Surprise
Crowfoot
Davis Creek
Fairport
New Pine Creek
Willow Ranch
Pelican Lake
Bidwell
Triangle
Day
Lookout
Adin
Bieber
Pittville
Fall River Mills
Hayden Hill
Moll Ranch
Madeline
Prockmans
Red Rock
Glade
Termo
Ravendale
Dixie
Madelin
Champ
Shurmay
Swaverly
Spanish Creek
Horsehead
Antelope
Secret
Karlo
Hoop
Meiggsville
Halls
Murray
Litchfield
Hot Sps
Wendel
Amedee
Stacy
Italy
Calneva
Doyle
Omira
Constantia
Red Cap
Scotts
Kamero
Chat
Chilcoot
Plumas Jc.
Facht
Coppervale
Johnstonville
Clinton
Standish
Lassen
Buntingville
Edgemont
Honey Lake
Milford
Ray
Silver Lake
Shaw Lake
Snake Lake
Crater Lake
Butte Lake
Juniper Lake
Gallatin
Lake Almanor
Spekts Swamp
Willow Creek
Pine Cr.
Rail Road Cr.
RAILWAYS
HIGHWAYS
POST OFFICES
OTHER PLACES
Scale of miles.
0 5 10 15 20 25 30
STATE MINING BUREAU - 1916
W.E. CONDON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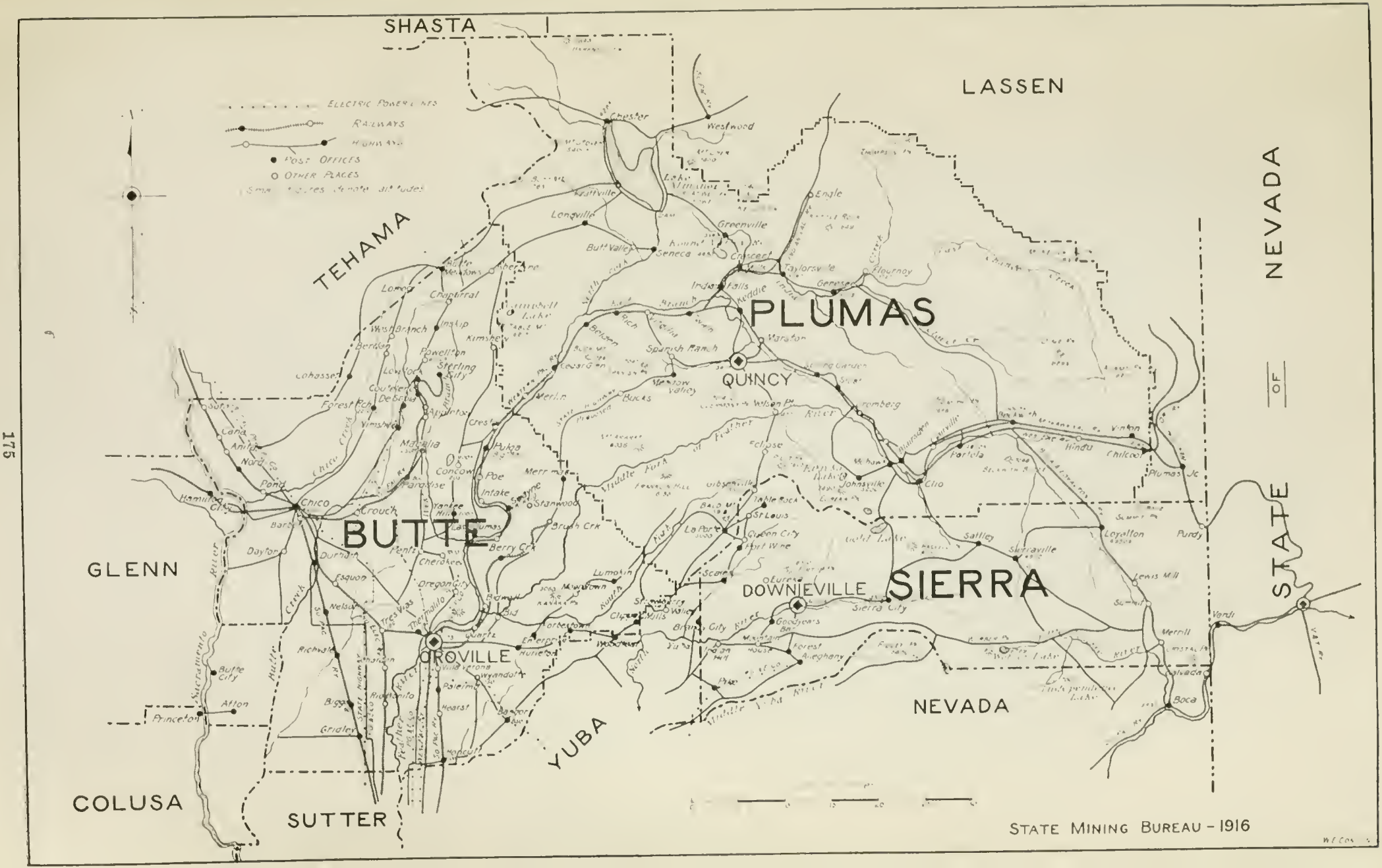
PACIFIC OCEAN
EUREKA
WEAVERVILLE
REDDING
RED BLUFF
Scale of miles
STATE MINING BUREAU - 1916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PLUMAS
QUINCY
BUTTE
GLENN
OROVILLE
SIERRA
DOWNIEVILLE
NEVADA
YUBA
COLUSA
SUTTER
STATE OF
ELECTRIC POWER LINES
RAILWAYS
HIGHWAYS
POST OFFICES
OTHER PLACES
Chester
Westwood
Lake Almanor
Prattville
Longville
Greenville
Seneca
Crescent
Taylorsville
Engle
Flournoy
Genesee
Indian Falls
Keddie
Warston
Spanish Ranch
Meadow Valley
Bucks
Berlin
Merrimac
Belden
Rich Bar
Lee Grant
Lumbell Lake
Lake Willow
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Lake Wash
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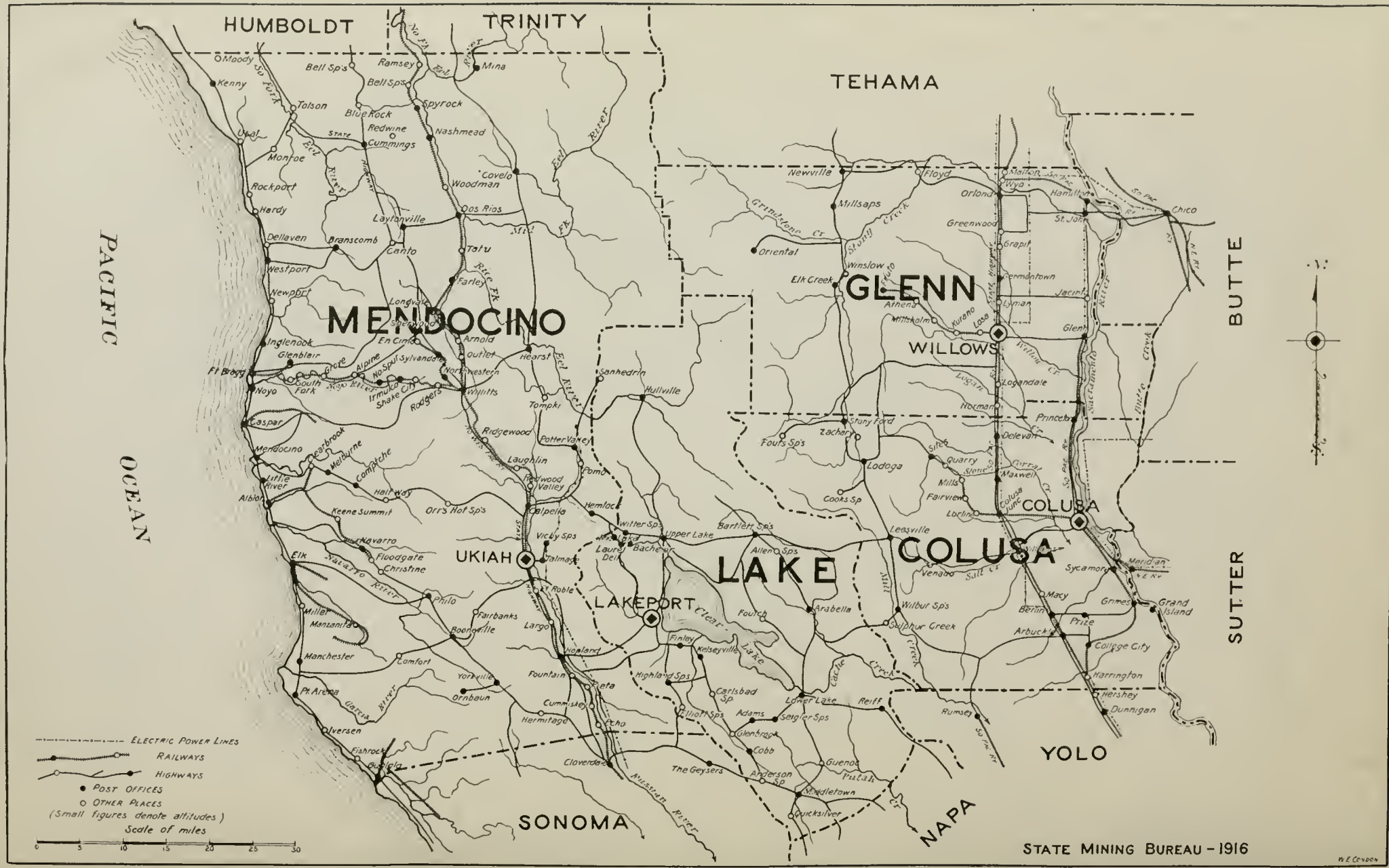
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LAKEPORT
SUTTER
YOLO
NAPA
SONOMA
PACIFIC
OCEAN
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Russian River
Clear Lake
Sulphur Creek
Cache Creek
Putah Cr.
Sacramento River
Stony Ford
Princeton
Colusa Junc.
Maxwell
Williams
Arbuckle
College City
Harrington
Hershey
Dunnigan
Grimes
Grand Island
Meridian
Sycamore
Venado
Wilbur Sp's
Arabella
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Bartlett Sp's
Upper Lake
Witter Sp's
Vichy Sps
Allen Sps
Cooks Sp
Fouts Sp's
Zachary
Lodoga
Hullville
Sanhedrin
Willits
Tomki
Ridgewood
Potter Valley
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Orr's Hot Sp's
Keene Summit
Half Way
Comptche
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Manchester
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Yorkville
Ornbaun
Pt. Arena
Iversen
Fishrock
Cuffield
Hermitage
Cummisky
Fountain
Highland
Largo
Fairbanks
Boonville
Yokayo
Eureka
Highland Sps
Finley
Kelseyville
Carlsbad Sp
Elliott Sps
Adams
Seigler Sps
Lower Lake
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Glenbrook
Cobb
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Putah
Middletown
Anderson Sp
The Geysers
Cloverdale
Pieta
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Mina
Bell Sps
Spyrock
Nashmead
Blue Rock
Redwine
Cummings
Tolson
Moody
Kenny
Ukal
Monroe
Rockport
Hardy
Dellaven
Westport
Newport
Branscomb
Cahto
Layton ville
Covelo
Woodman
Dos Rios
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ELECTRIC POWER LINES
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(Small figures denote altitudes)
Scale of miles
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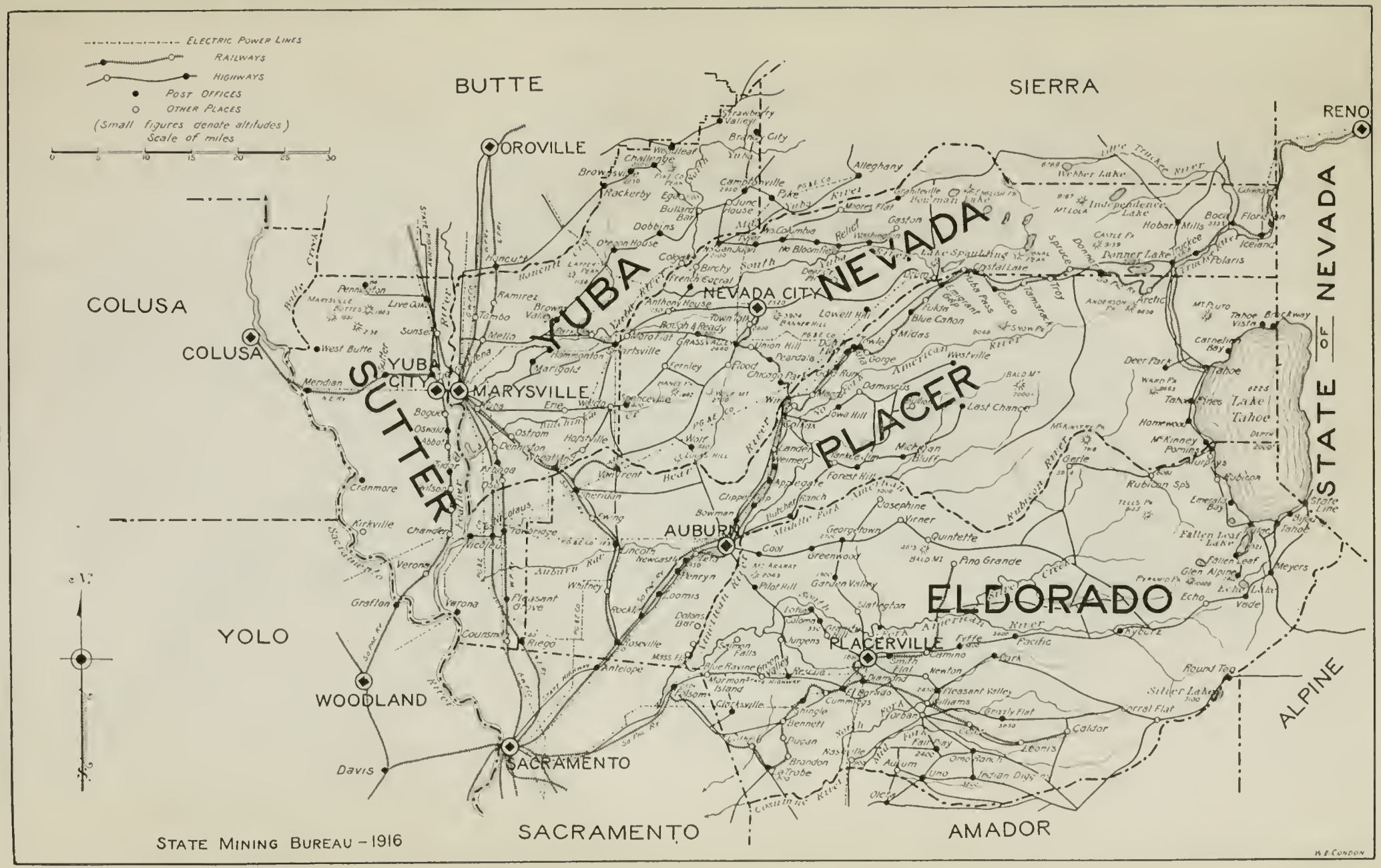
STATE MINING BUREAU - 1916
W E Crouch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(Small figures denote altitudes)
Scale of miles
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RENO
OROVILLE
COLUSA
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PLACER
EL DORADO
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SACRAMENTO
AMADOR
ALPINE
NEVADA CITY
MARYSVILLE
YUBA CITY
COLUSA
AUBURN
PLACERVILLE
WOODLAND
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Lake Tahoe
Donner Lake
Webber Lake
Independence Lake
Truckee
Tahoe
Meyers
Fallen Leaf Lake
Rubicon Spg
Round Top
Stiller Lake
Caldor
Kirkville
Cranmore
Davis
Folsom
Auburn
Grass Valley
Colfax
Dutch Flat
Forest Hill
Georgetown
Placerville
Diamond Springs
Pollock Pines
Camino
Fyffe
Pacific
Echo Lake
Glen Alpine
Emerald Bay
Tahoe Vista
Carnelian Bay
Deer Park
Homewood
McKinney Bay
Gerle
Truckee River
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Bear River
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Sacramento River
Middle Fork
North Fork
South Fork
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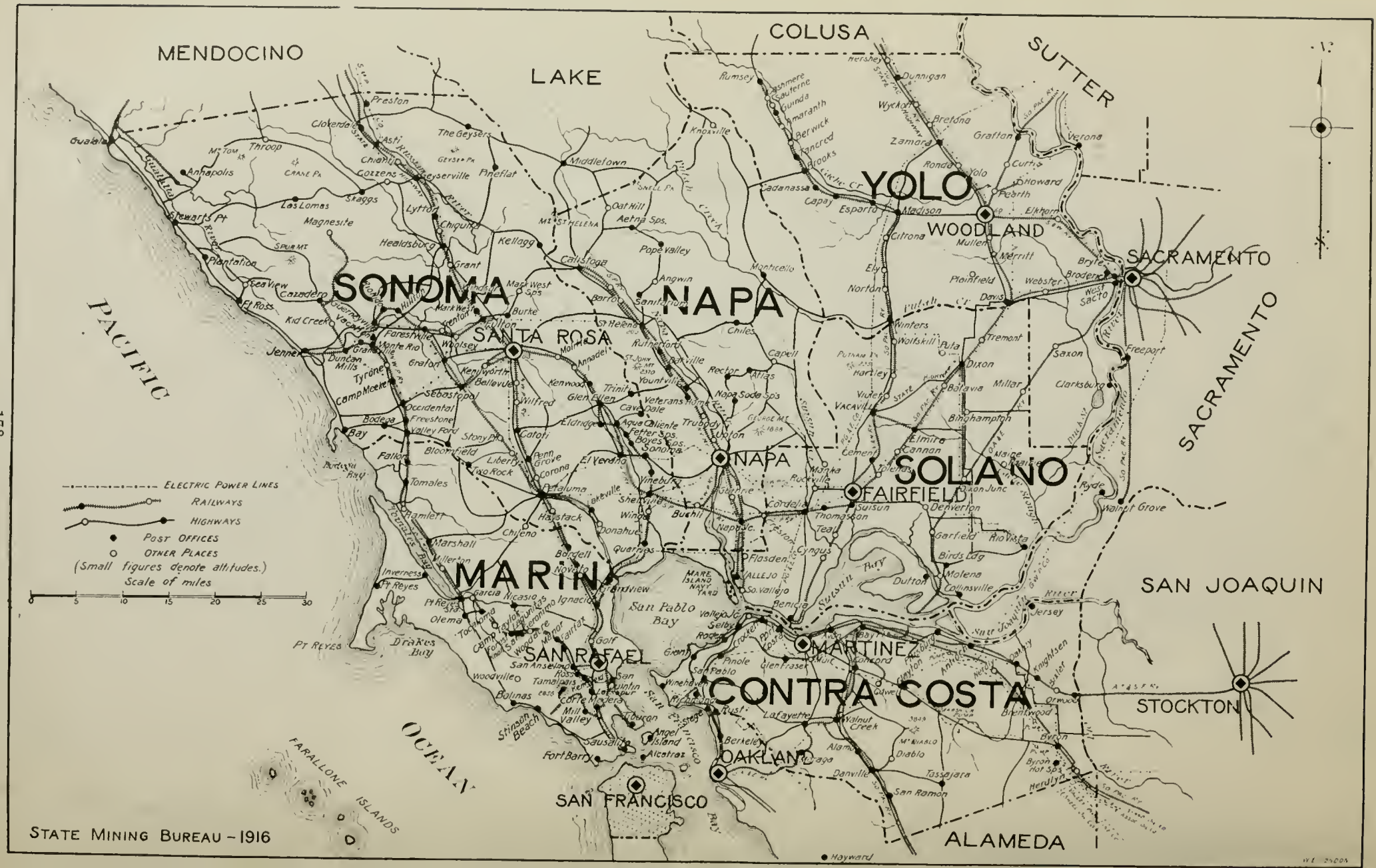
W. E. CONDON


MENDOCINO
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SAN RAFAEL
MARTINEZ
CONTRA COSTA
STOCKTON
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SACRAMENTO
PACIFIC
OCEAN
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OAKLAND
ALAMEDA
San Pablo Bay
Suisun Bay
Drakes Bay
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FARALLONE ISLANDS
ELECTRIC POWER LINES
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OTHER PLACES
(Small figures denote altitudes.)
Scale of miles
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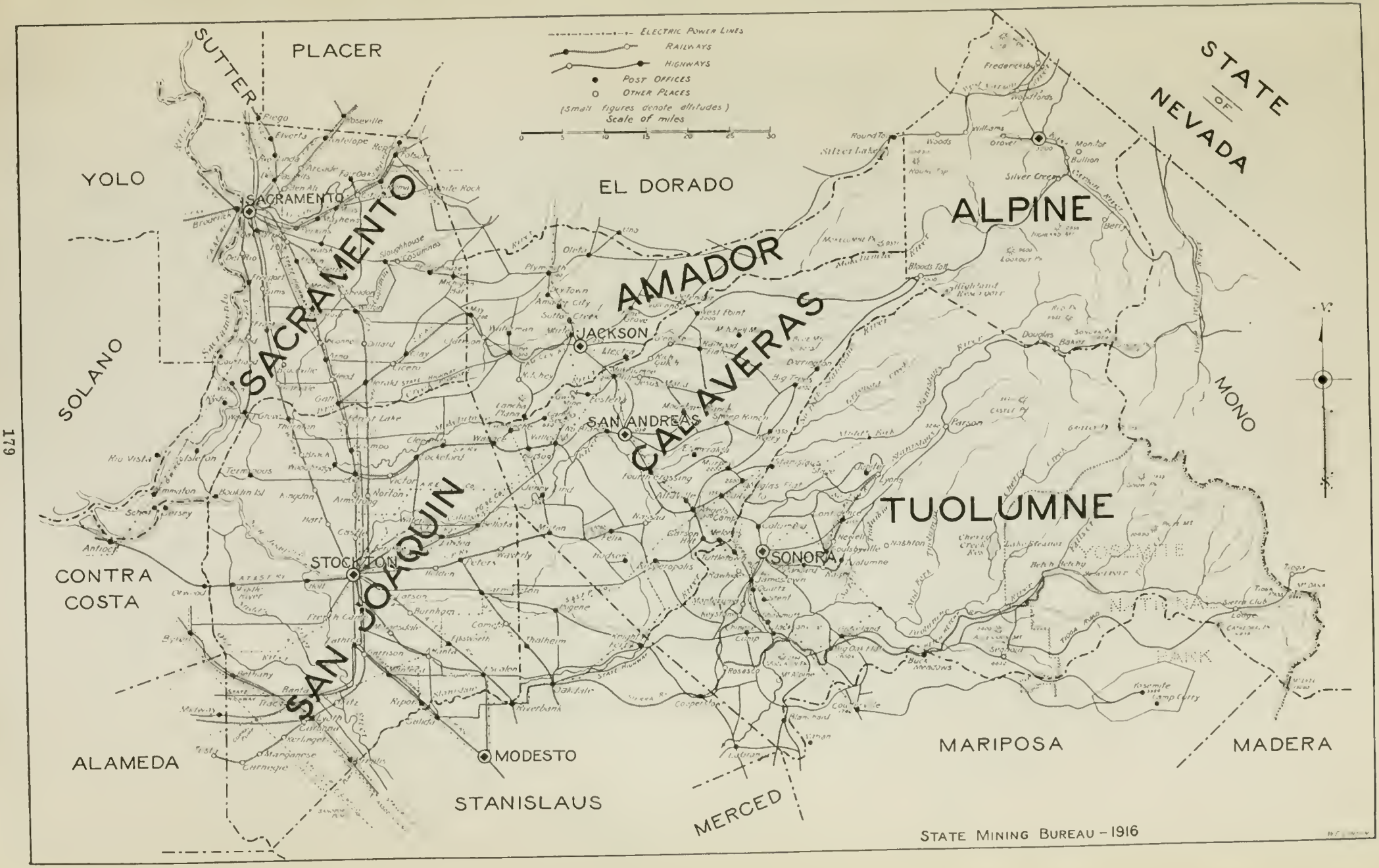
STATE MINING BUREAU - 1916


ELECTRIC POWER LINES
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(Small figures denote altitudes)
Scale of miles
0 5 10 15 20 25 30
SUTTER
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STATE OF NEVADA
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TUOLUMNE
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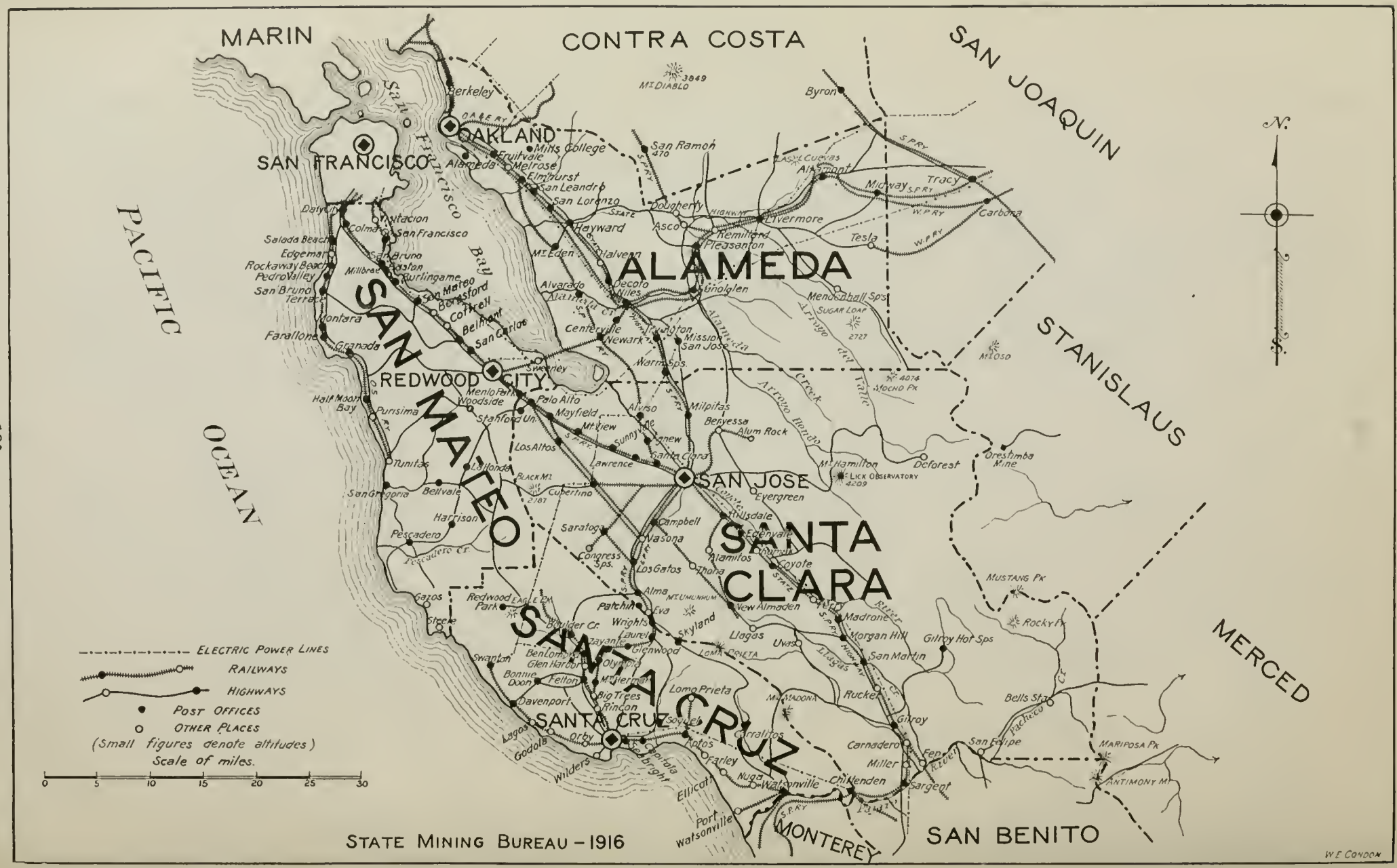
STATE MINING BUREAU - 1916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MONTEREY
SAN BENITO
STANISLAUS
MERCED
OAKLAND
SAN FRANCISCO
REDWOOD CITY
SAN JOSE
Berkeley
Alameda
Mills College
Fruitvale
Melrose
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San Leandro
San Lorenzo
Hayward
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Dougherty
Byron
Altamont
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Livermore
Carbona
Tesla
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Mt. Diablo 3849
Mt. Eden
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Mission San Jose
Warm Sps
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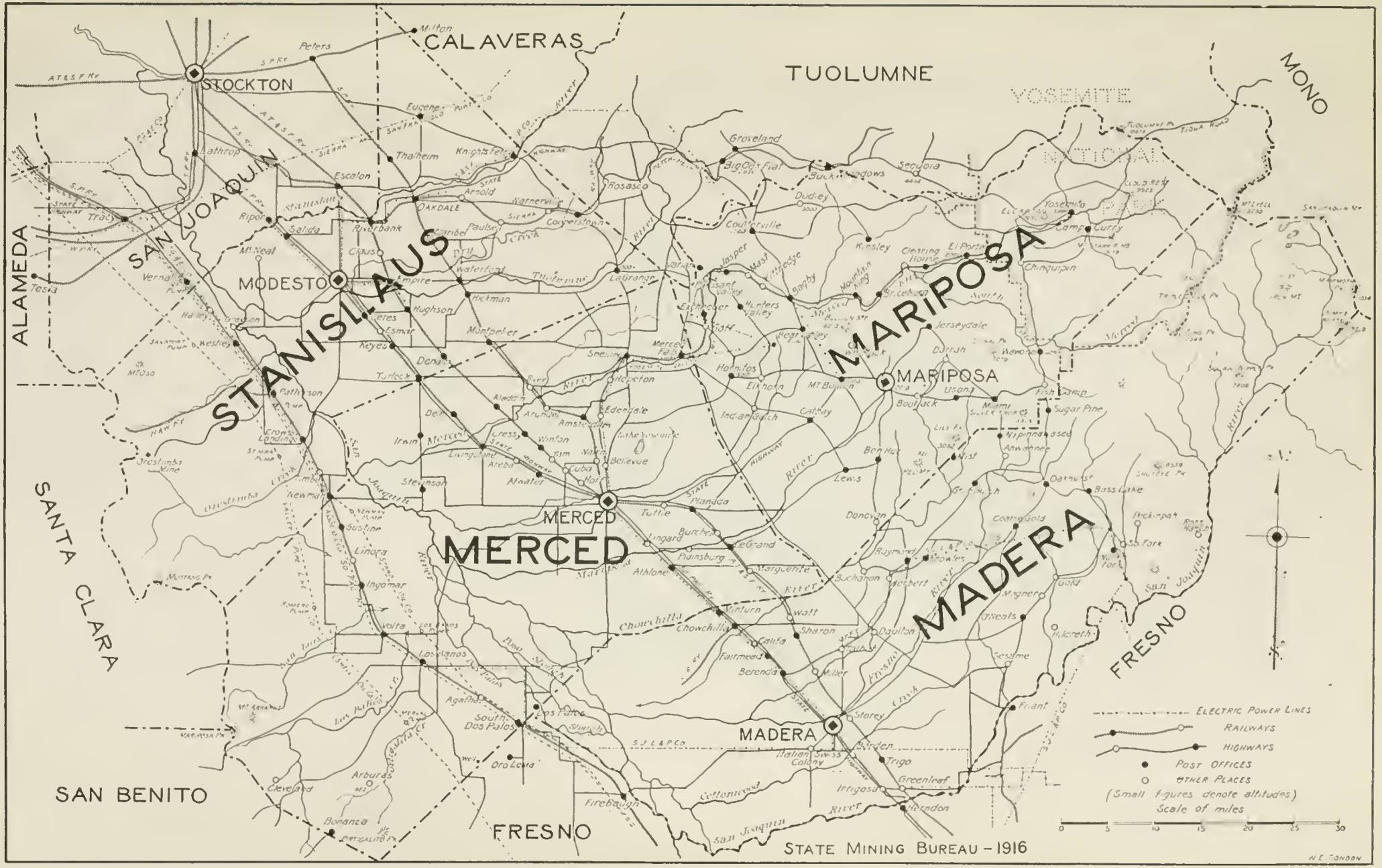
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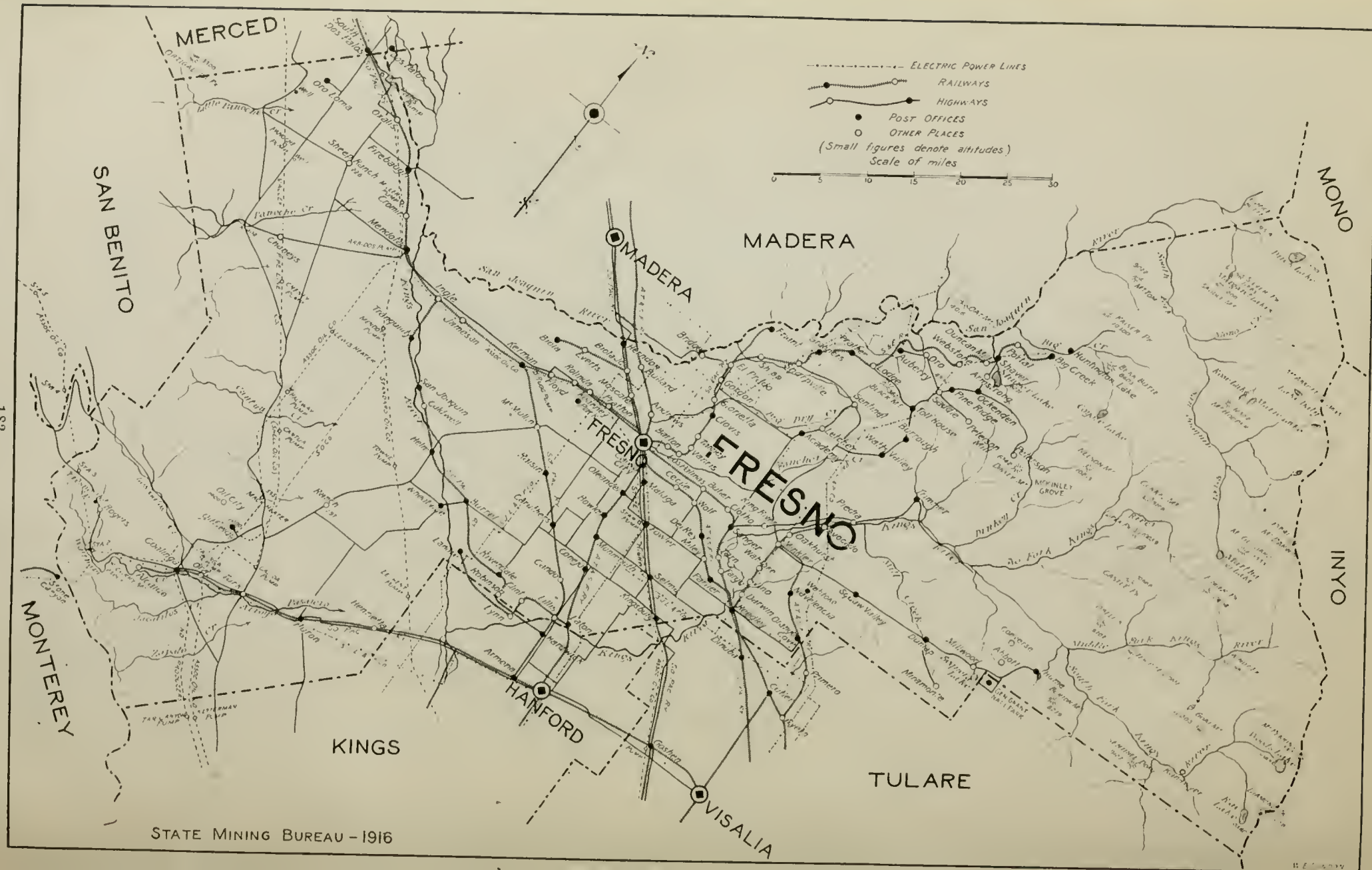
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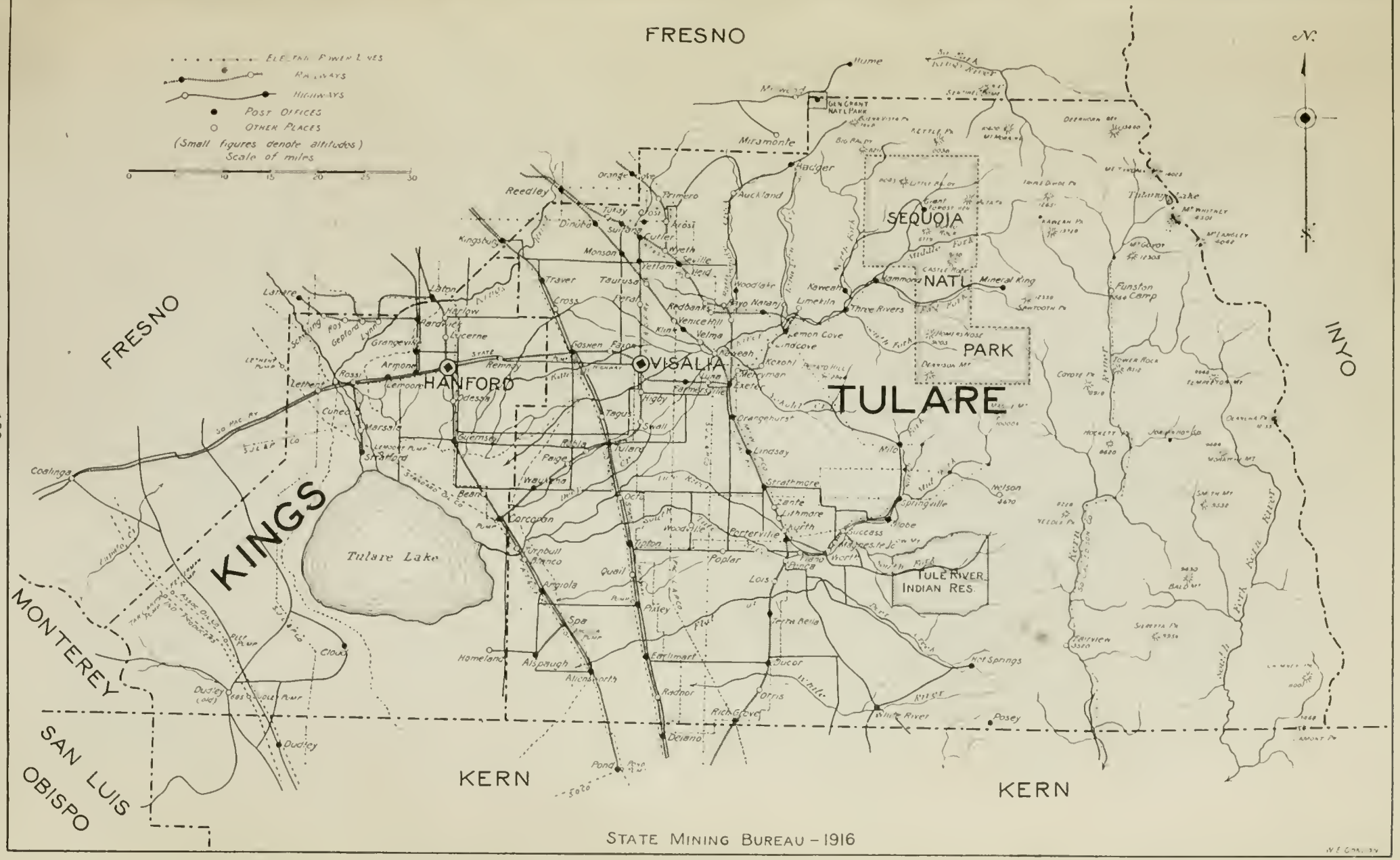
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TULE RIVER INDIAN RES.
Hume
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Badger
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Orange Cove
Trimero
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Monson
Seville
Traver
Tauruse
Veltam
Yield
Woodlake
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Lemon Cove
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Three Rivers
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Kammoo
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Funston Camp
Tunnel Rock
Lemoore
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Harlow
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Visalia
Tagus
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Porterville
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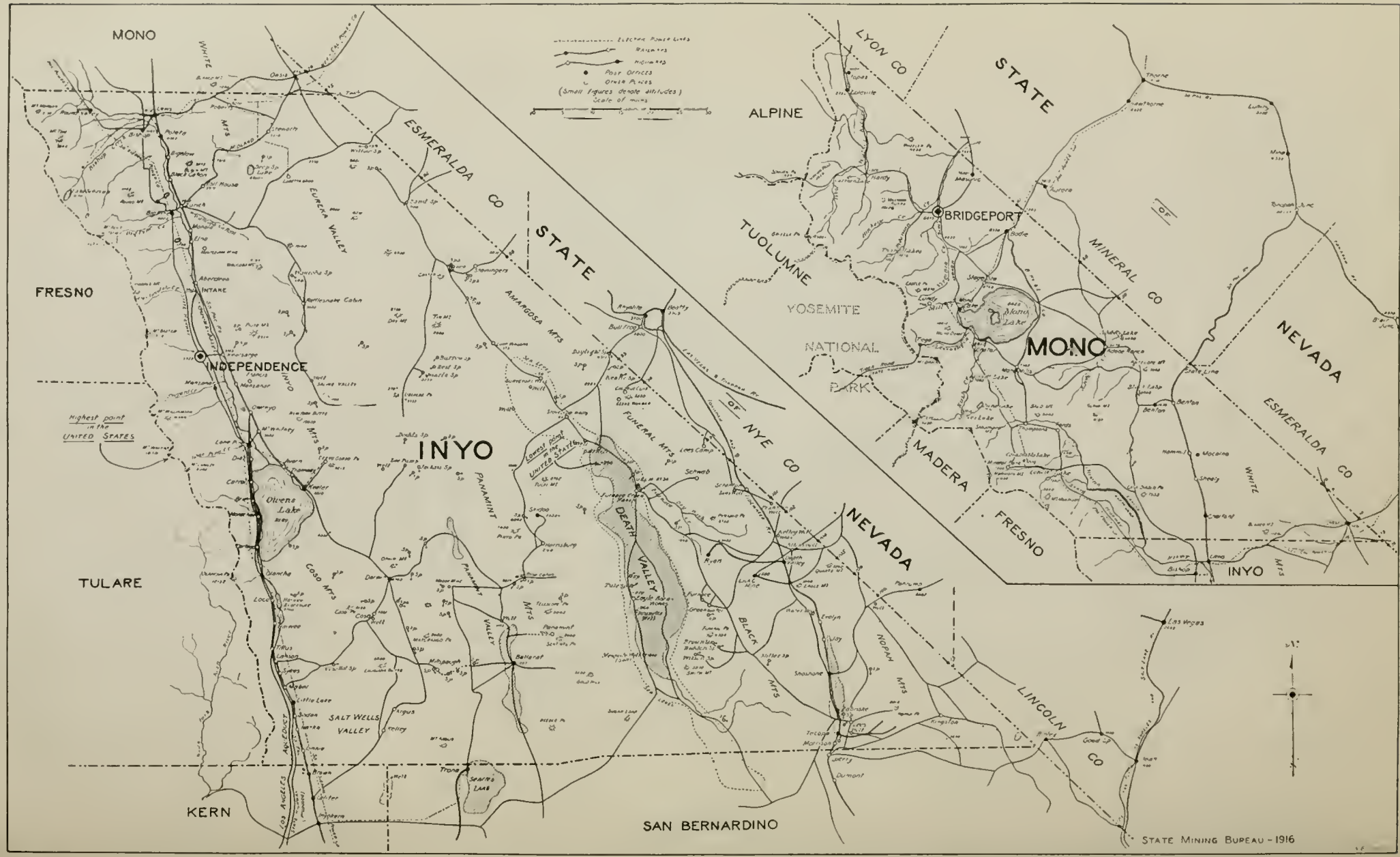
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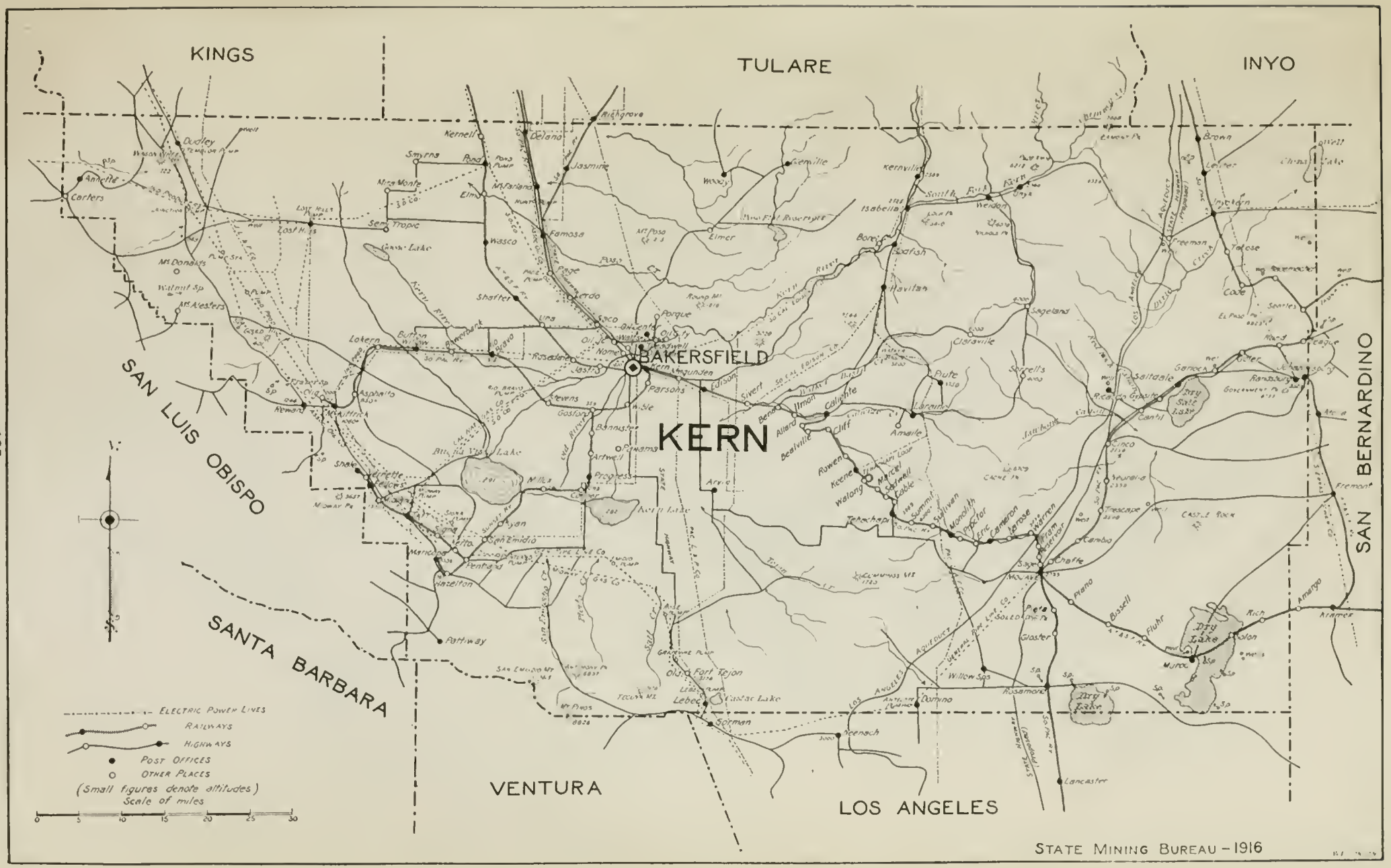
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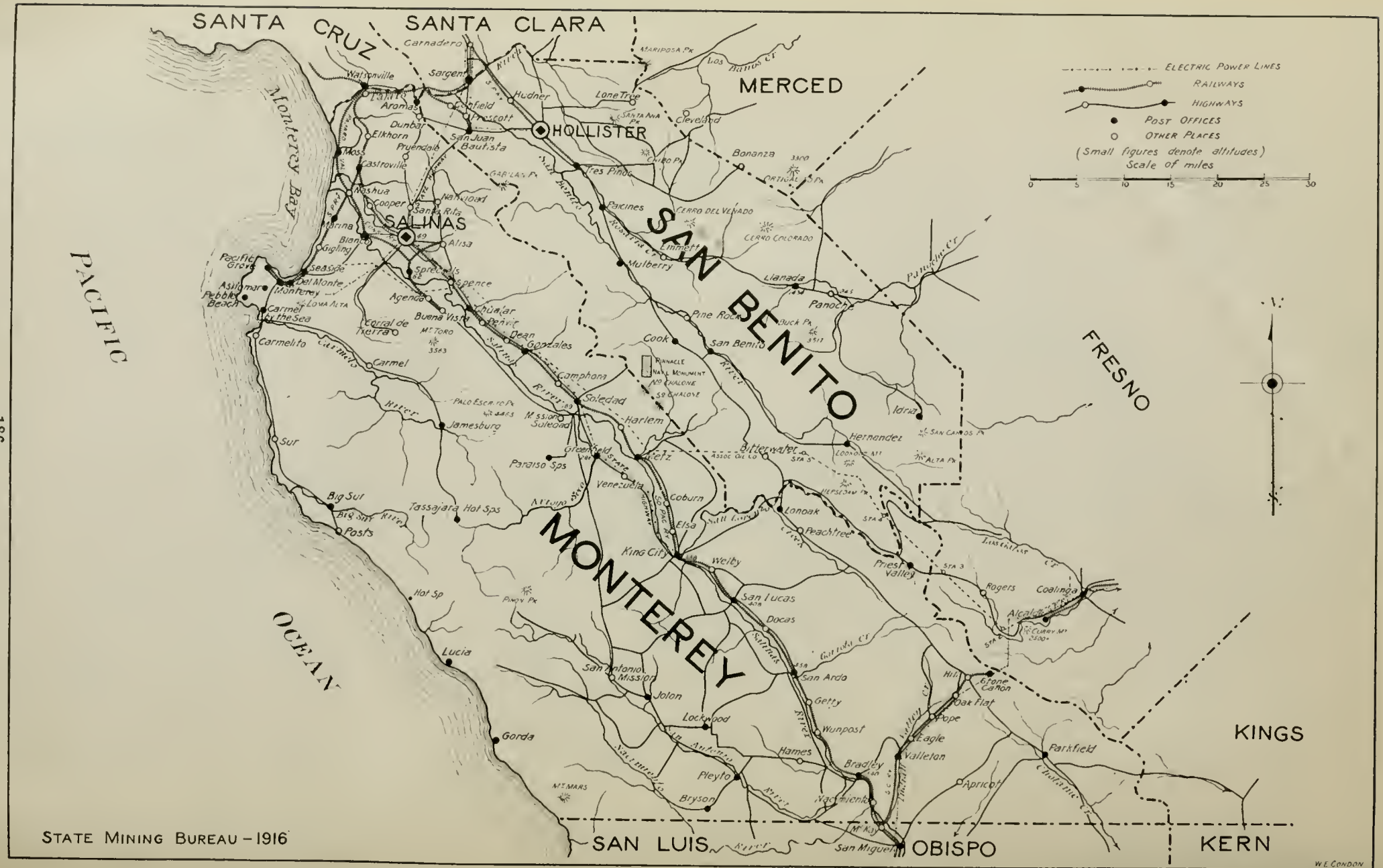
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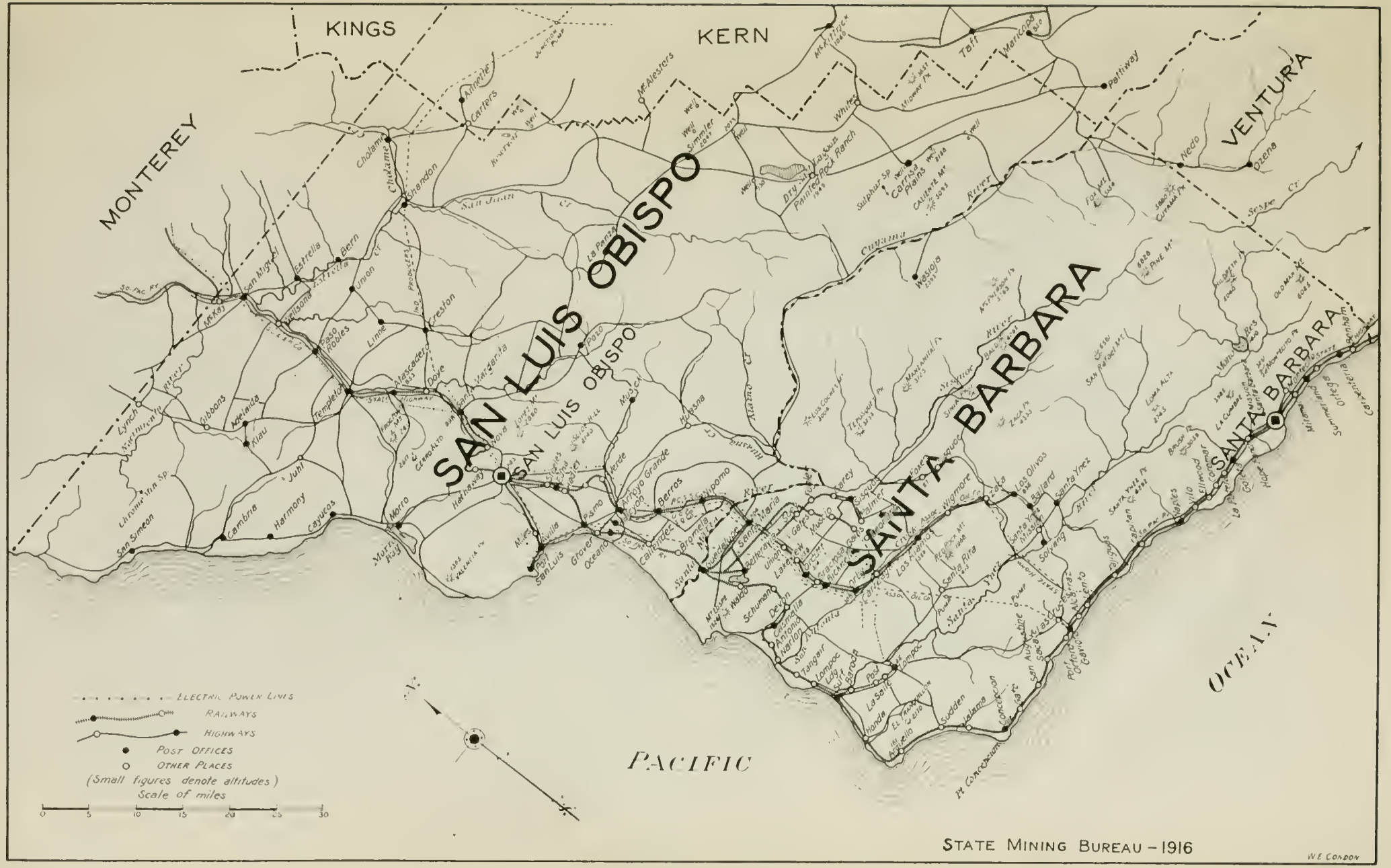
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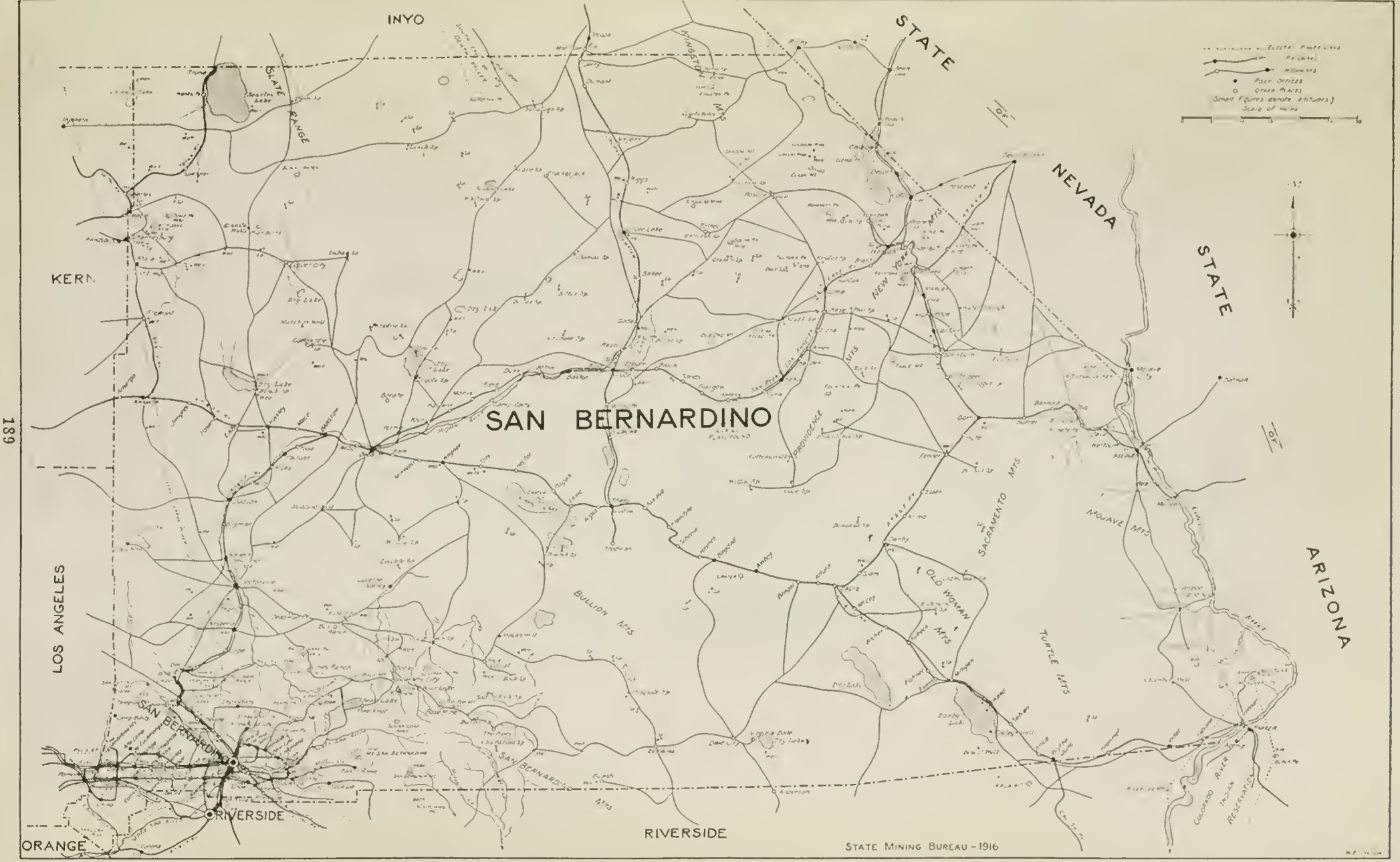
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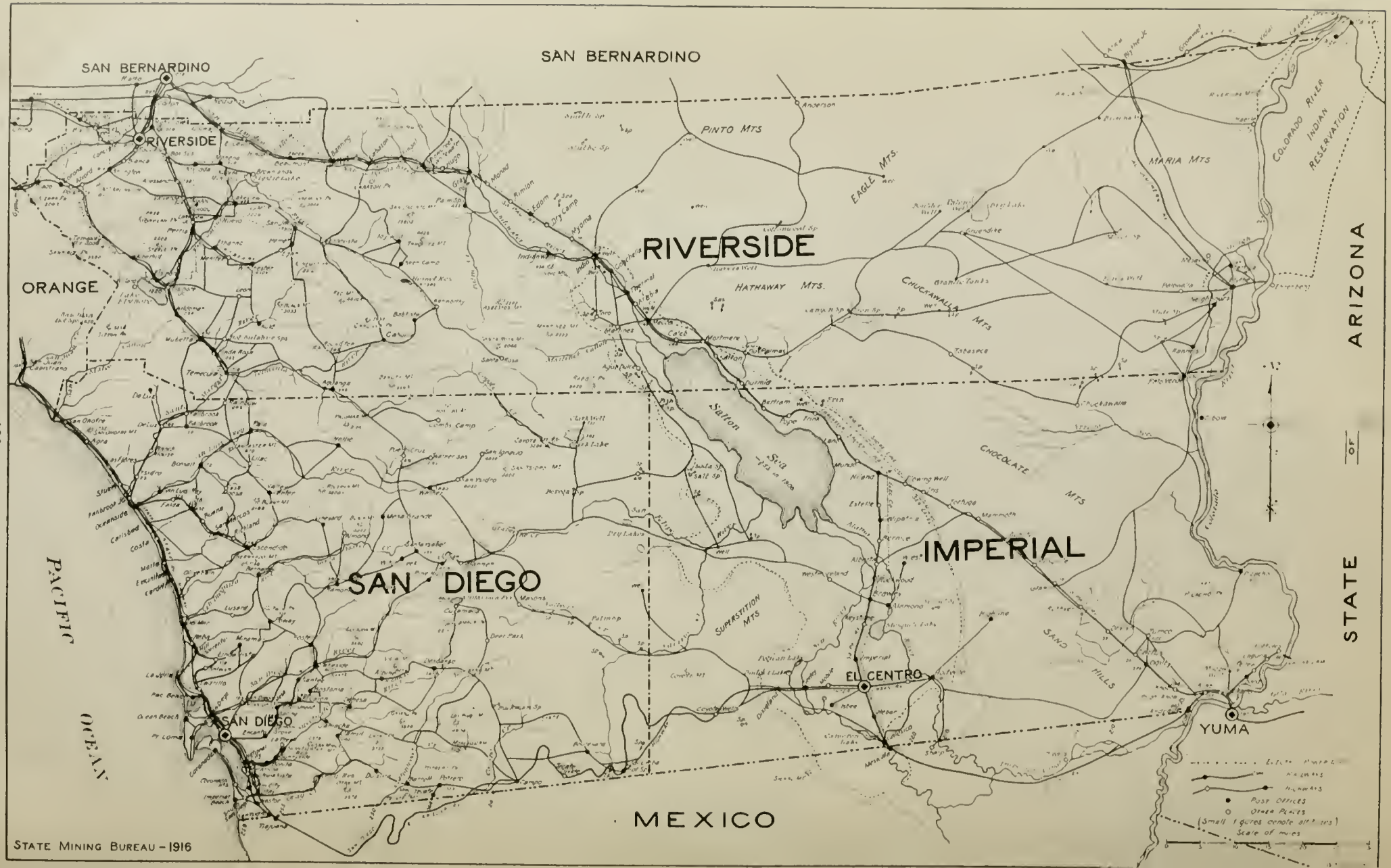
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